FEB. 17 1961

PETROLEUM WEEK

A McGRAW-HILL PUBLICATION

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SPECIAL REPORT / **OFFSHORE**

1961 may be the best year yet.....36

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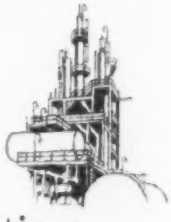
in refining operations,
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is not good enough.

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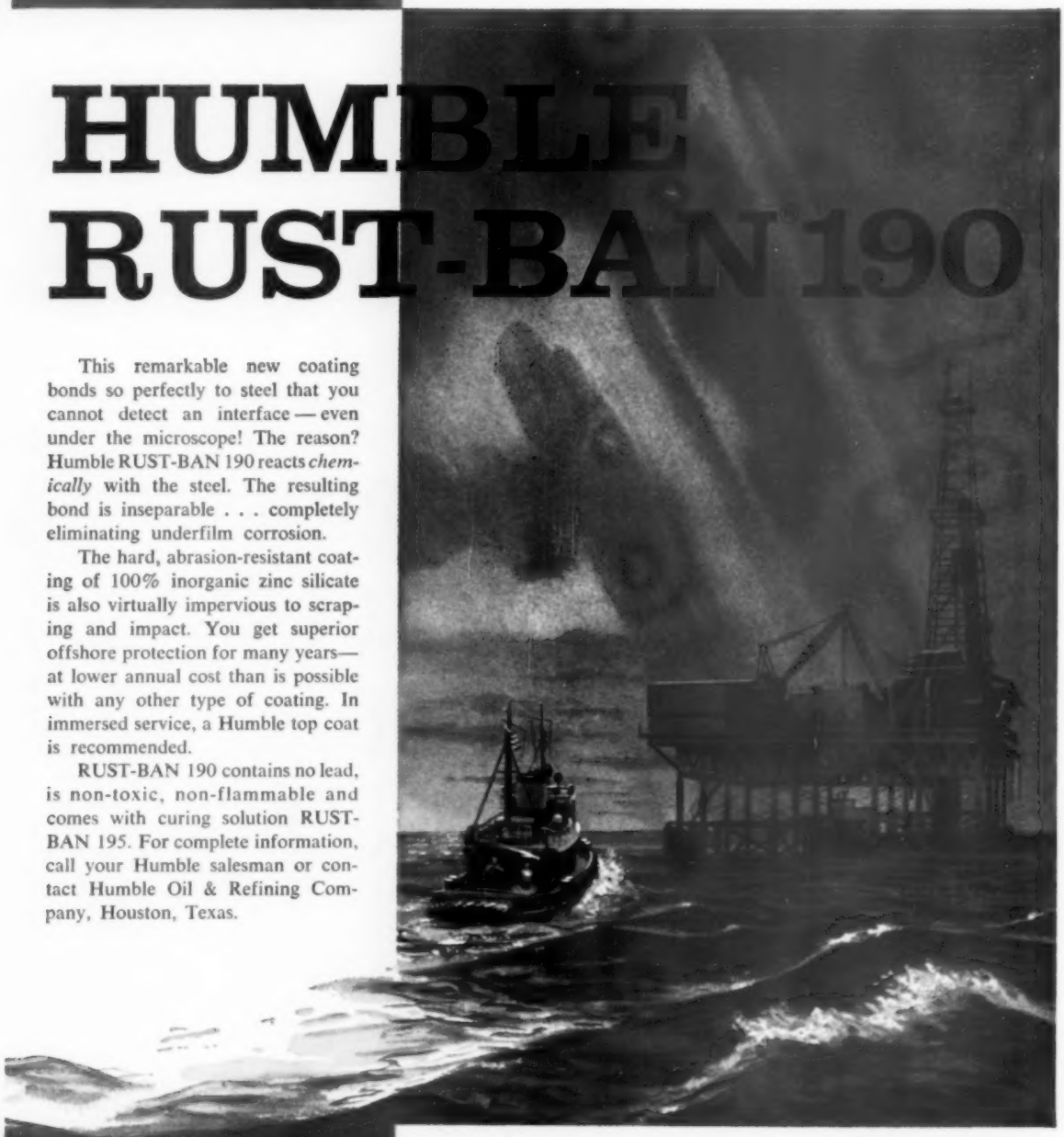

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INSIDE *Slant*

EMPHASIS ON GAS

That more and more emphasis is being placed on the finding of gas is supported in a recent statement by Dean A. McGee, president of Kerr-McGee Oil Industries, Inc.

He told the New York Society of Security Analysts, Inc., that:

"We expect to step up our oil and gas exploration activities even more and will continue to place major emphasis on finding gas."

Why?

The answer is simple. Until 1958, oil produced more revenue than gas for Kerr-McGee, but during fiscal 1959, gas income exceeded that of oil and this relationship has continued since.

McGee told the analysts "we feel this trend is important to our company because gas sold at contracted prices, over long periods, produces stable income."

The fruits of income from gas are not uncommon to the industry.

Where a gas well was frowned on just a few years back, such production now is desired.

Gas production isn't subject to the low allowables necessary to keep oil supply in balance with demand.

LeRoy Menzing
EDITOR

Good Wells Make Good News

Reports Showing How Dowell Helped Operators Improve Wells

February 17, 1961

Here are four recent cases showing how Dowell products and services have helped operators increase net profits from wells.

- **Calcasieu Parish, South Louisiana** (Old Oil Well) Production from this well had remained 40 bopd with 400 psi flowing pressure during 10 months following completion. Pay was the Miocene from 10,528 to 10,542 feet. The operator suspected mud damage to the formation. Dowell injected 40 gallons of Mudban* in 2000 gallons crude followed by a flush containing a Dowell foaming agent for oil. Treatment was performed with Christmas tree in place. After treatment, well flowed 8 to 10 barrels mud, then cleaned up. Production rose to 120 bopd with 1200 psi flowing pressure.

- **Barber County, Kansas** (Abandoned Oil Well) This well in the Rhodes pool had been down for eight months. Pumping unit, rods and tubing had been removed and the well had been sold to the present owner for salvage. Dowell treated well with Blue Paraffin Solvent; a Dowell solvent designed for paraffins containing asphaltic material. Before treatment, a swab test showed no fluid. 50 gallons of Paraffin Solvent and 1000 gallons kerosene were circulated and then displaced into the formation. After treatment, well swabbed 13 bopd and was put on pump.

- **Upton County, West Texas** (New Oil Well) This well was completed open hole into the Ellenburger between 12,311 and 12,327 feet. The formation would not break down at 5000 psi -- the permissible surface working pressure. The operator decided to use Rockshock* implosion service to reduce breakdown pressure. Dowell ran four 10-inch glass capsules and imploded them opposite the pay. Formation then accepted 7500 gallons acid down two-inch tubing at 4100 psi and 3 bpm. Before treatment, the well swabbed dry. After treatment, it flowed 354 bopd through a 20/64-inch choke.

- **Wayne County, Illinois** (Old Oil Well) The operator of this pumping well had been plagued with rod breaks. Production of 5 bopd and 50 bwpd was from the Aux Vases sand. Thirty-five ⅞-inch rods had to be replaced during the twelve-month period before Dowell was asked to start a corrosion inhibitor treating program. One pint of Corban* 207 was dumped down casing every other day. There was not a single rod break during the first year after treating was begun. Down-hole equipment and tubing also remained in good condition. Treatment cost was only $60.00 per year.

Talk your production problems over with your Dowell representative. The chances are good he can help you improve production or decrease costs with Dowell products or services. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela, Argentina, Germany, France and the Sahara area. Dowell, Tulsa 1, Oklahoma.

*DOWELL TRADEMARK

Services for the oil industry DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

60-Second Summary

WHAT'S HAPPENING IN OIL

February 17, 1961

dept/INDEX

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A sharp improvement this year is brightening the chances for upward adjustments in crude prices. A general advance is not expected, but rather increases by areas—similar to the manner by which prices were reduced in the past two years. . . . p. 11

•

All indicators point to a substantial expansion in offshore activity in 1961, with the focus on submerged lands off Louisana. A special report highlights the tempo of construction yard work, where the emphasis is on deep-water units. . . . p. 36

•

Domestic productive capacity has continued to increase, but the gain has been slowed by the decline in drilling since 1956. That is the finding of a National Petroleum Council committee, which reported that the ability to produce crude is rising faster than reserves. . . . p. 14

•

Oil is stepping up its representation in Washington. API's Frank M. Porter is going to spend more time there as part of the program to have an industry spokesman on hand as much as possible. . . . p. 18

•

Playing games on the job is common practice with some oil men. It's not for recreation, but a management approach to training—the idea being to stimulate thinking, and simulate industry operations. . . . p. 68

•

Argentina has sewed up part of a competitive crude market heretofore largely supplied by Venezuela. The move is seen as partly political, since Argentina isn't yet self-sufficient in crude. . . . p. 74

•

How will offshore leases be regulated once the federal-state landownership hassle is finally settled? Many oil men are wondering about that, and there are indications that federal leases could get higher allowables. . . . p. 20

•

Venezuela's national oil company is moving ahead with plans to drill its first test in Lake Maracaibo. It expects to have a platform ready in two months. . . . p. 74

•

Eastern fuel oil dealers aren't too happy about the snowstorms that have hit the East Coast. For many, they meant that cold weather gains were wiped out by the snow, which crippled deliveries. . . . p. 78

•

Changes are being made in design of natural gas plants, dictated by the leaner gas streams being discovered in the U.S. . . . p. 63

Up to the Minute / SIGNIFICANT LATE NEWS

February 17, 1961

Texas crude production next month will be based on a ten-day schedule, the first since last March. The initial allowable will average 2,980,842 b/d, up 204,952 b/d over the mid-February permissible, which was based on an eight-day schedule.

Comments at the Railroad Commission's statewide hearing were generally optimistic. "The oil industry seems to be first in line leading industry out of the depression," Ernest O. Thompson, senior member of the commission, observed. He added: "By reason of careful regulation by the commission over a long period, the industry worked off its surplus inventory of crude and products." Data submitted by 39 purchasers showed their Feb. 1 stocks of crude 7,142,000 bbl. below desired levels; product stocks were 8,381,400 bbl. less than desired.

New Mexico's crude allowable in March will remain unchanged. The Oil Conservation Commission continued the basic unit allowables of 35 b/d in the southeast and 70 b/d in the northwest.

•

The government is being urged to boost East Coast residual fuel import quotas for the first quarter by 20%. The request comes from the Petroleum Industry Research Foundation, supported mainly by some major companies and fuel oil jobbers. It wants the January-March quota hiked by 106,000 b/d to 636,000 b/d, slightly under the allocation for the first quarter of 1960. It recommends a 348,000 b/d quota for the second quarter, up slightly from 1960.

•

Ohio Oil Co. will supply Dow Chemical Co. with 20-million gal. of benzene-toluene mixture annually over a long period, starting in mid-1962. Half of the supply will come from Ohio's Robinson (Ill.) refinery and the remainder from new units to be built at an affiliate's Detroit refinery. Buckeye Pipe Line Co. will build a 42-mi. line to a new unit to be built at Dow's Bay City (Mich.) plant.

•

No decision on the key question of oil prices was reached by Venezuela and its Middle Eastern associates at their meeting in Caracas. Resolutions they issued this week call for further studies of pricing and of "excessive" oil company profits. The 4,000-word text contains no concrete measure for immediate execution.

•

At mid-week, Lee Loevinger of Minnesota appeared to be a leading contender for chief of the Justice Dept.'s antitrust division. If appointed, the Minnesota Supreme Court judge would fill the position formerly held by Robert A. Bicks.

•

Sunray Mid-Continent Oil Co. plans to attempt the industry's first octuple completion in the McFaddin field of Victoria County, Texas. The assembly, produced by Oil Center Tool Co., has four strings of 2½-in. tubing, each containing a macaroni string of 1½-in. tubing.

Views That Make News

Dear Sir:

Re the article by Dr. H. Zenor, "Oil May Be Found In Any Type Rock" [PW—Dec.30'60,p26], and subsequent readers' comments:

Personal observations throughout the world indicate that the accumulation of petroleum is no respecter of rock type, geologic age, nor structure.

Was it not Miguel Servetc, the Spanish scholar and anatomist, who in 1533 was burned at the stake, at the urging of the famous religious expert, John Calvin, for daring to cut up a human body to prove his doctrine of the circulation of the blood?

And 100 years later (1633), was it not Galileo, the Italian astronomer and physicist, who was forced to recant and abjure (on his knees) his great truths and facts that the world was round and the earth did move around the sun, in the presence of an ecclesiastic assembly in Rome, under penalty of having his tongue torn out and life imprisonment?

In the words of Charles Buck, the 19th Century English clergyman:

"The bigot clings to opinions adopted without investigation and defended without argument, while he is intolerant of the opinions of others." What price orthodoxy!

HENRY CARTER REA
Geologist
Littleton, Colo.

Dear Sir:

I was very disappointed to read the article entitled "Small-Tract Issue Again Boils in Texas" [PW—Jan.6'61, p28]. Your writer appears to be way off when he says, "The issue, resolved to its simplest terms, involves the right of any property owner to drill on his acreage, however small."

This is not the case at all. It's not that so many of us object to the owner of a small tract drilling on his acreage. Instead, we object to the small tract owners' self-pro-claimed right to be guaranteed a profit on their operation to the extent of being permitted to drain their neighbors' property.

The merits of this issue can be clearly seen by comparing it to a cattle-raising operation where there are 1,600 acres of grazing land divided up into 160-acre fields, with the exception of a single 1-acre field. Let's presume that the owners of the grazing land wish to raise beef cattle. No one disputes the right of the owner of the 1-acre tract to endeavor to raise cattle. We don't see, though, that he inherently must be guaranteed a profit where profit is impossible. How can every owner of a 1-acre tract make a profit on a business that takes more land than that to succeed?

Paraphrasing the small tract owner's position, he is saying, in effect, "I don't have enough grass on my land to enable me to make a reasonable profit in the cattle business, but if I can graze them on my neighbors' land, an adequate profit is possible. To deny me the right (?) to let my stock run on my neighbor's land will make my operations unprofitable which, in effect, denies me the right to raise cattle."

Small-tract drilling does lead to unnecessary wells, and it does hike development costs; however, the important thing is the violation it does to property rights—unless, of course, our rights have been changed to the extent that stealing from larger land owners, etc., is legal.

JOHN E. GARRETT
Dallas, Tex.

Dear Sir:

There are two particular points in your article "U.S. Roadbuilding: Where Will Funds Be Raised to Meet Schedule?" [PW—Jan.20'61,p14] that I would like to clarify just a bit.

In the first place, none of the revenue from the 10% excise tax on automobiles is currently going into the highway trust fund. Actually, of the $4.3-billion collected in special federal automotive taxes during the 1960 fiscal year, more than $1.7-billion (primarily from the 10% excise tax on autos and the 8% tax on parts and accessories) was diverted to the general fund and withheld from the road program.

If the provisions of the 1959 Federal Aid Highway Act are allowed to go into effect as scheduled on July 1 of this year, the highway revenue from the fourth cent of the federal gasoline tax will be replaced, with a good deal to spare, by the receipts from half of the 10% auto excise tax and ⅜ of the 8% tax on parts and accessories. Official estimates are that these receipts will provide an additional $225-million per year for federal highway construction during the July 1, 1961-June 30, 1964, period. (I should point out that, even at the 3% rate, the federal gasoline tax was providing more than 80% of the trust fund revenues.)

As a second consideration, Congress does not really have to find an additional $10-billion to complete the Interstate System on schedule. If the dedicated portions of the auto parts and accessories taxes continue to be used for highways beyond 1964, total federal revenue for the Interstate System should come within less than $1-billion of meeting the $37-billion federal share of the cost over the life of the program.

As your article points out, the motorist is footing virtually the entire bill for the highway program, even though the benefits of this construction extend far beyond the user to include many other segments of the economy—the military included. Surely, as long as motorists are assessed with just about the entire cost of the program, then, at the very least, the special highway user taxes they are already paying should be used for their intended purpose—highways. Paying the whole bill is bad enough. But overpaying the bill is even worse.

JOHN H. BIVINS
Director
Committee on Public Affairs
American Petroleum Institute

Dear Sir:

I believe there is one statement in the article "Right-of-Way Service Business Bustling" [PW—Dec.30'60, p48] that would be confusing to the average reader. That being under the paragraph covering contractural agreements between service contractors and principals, in which the article states, "The most common form of contract calls for payment to the service company on the basis of ROW acquisition costs (consisting primarily of disbursements for easements), plus a stipulated percentage of these costs."

While this would be a most attractive control for my company, I am afraid if I were an oil company executive or pipeline executive, it would scare me half to death. I believe it was the intent to recite that the basis of payment for services was the cost of services plus a stipulated percentage of those costs.

GENE L. LAND
President
Universal Field Services, Inc.

PETROLEUM WEEK *will publish each week comments from readers on timely, pertinent subjects. Such expressions are welcome.*

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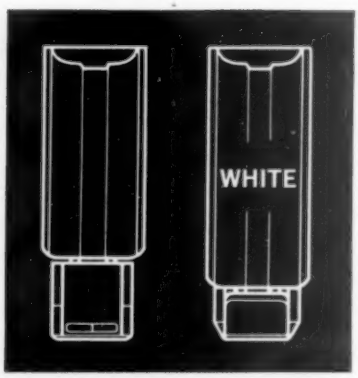
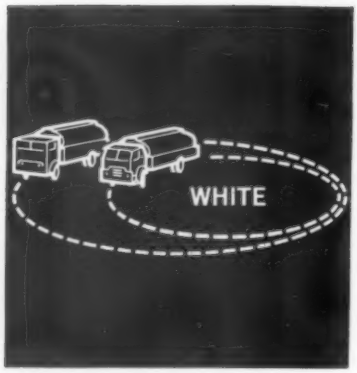
MEET THE NEW WHITE "COMPACT"





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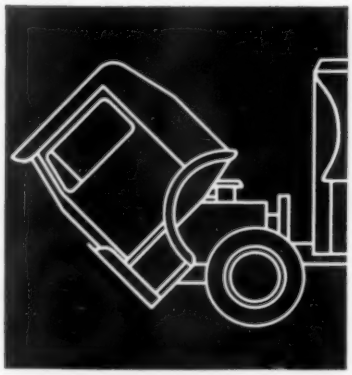

3 SERVICEABILITY: Designed to get the job done faster and at less cost. New manually operated tilt-cab has torsion-bar counterbalancing for safe, easy operation, quick engine accessibility.

Never before has there been a truck or tractor that can maneuver so much payload, at so little cost, so quickly — through city traffic, in and out of congested terminals and tight-squeeze unloading areas.

Because there's never before been a heavy-duty vehicle with an ultra-short wheelbase and a front wheel-cut of approximately 50 degrees in either direction!

Imagine a truck with a turning circle up to 22 feet smaller than other trucks, a tractor with a 12-foot turning advantage, and you'll begin to get the idea.

Figure faster trip times, wider territory coverage and bigger payloads, and *instantly* you get the whole picture:

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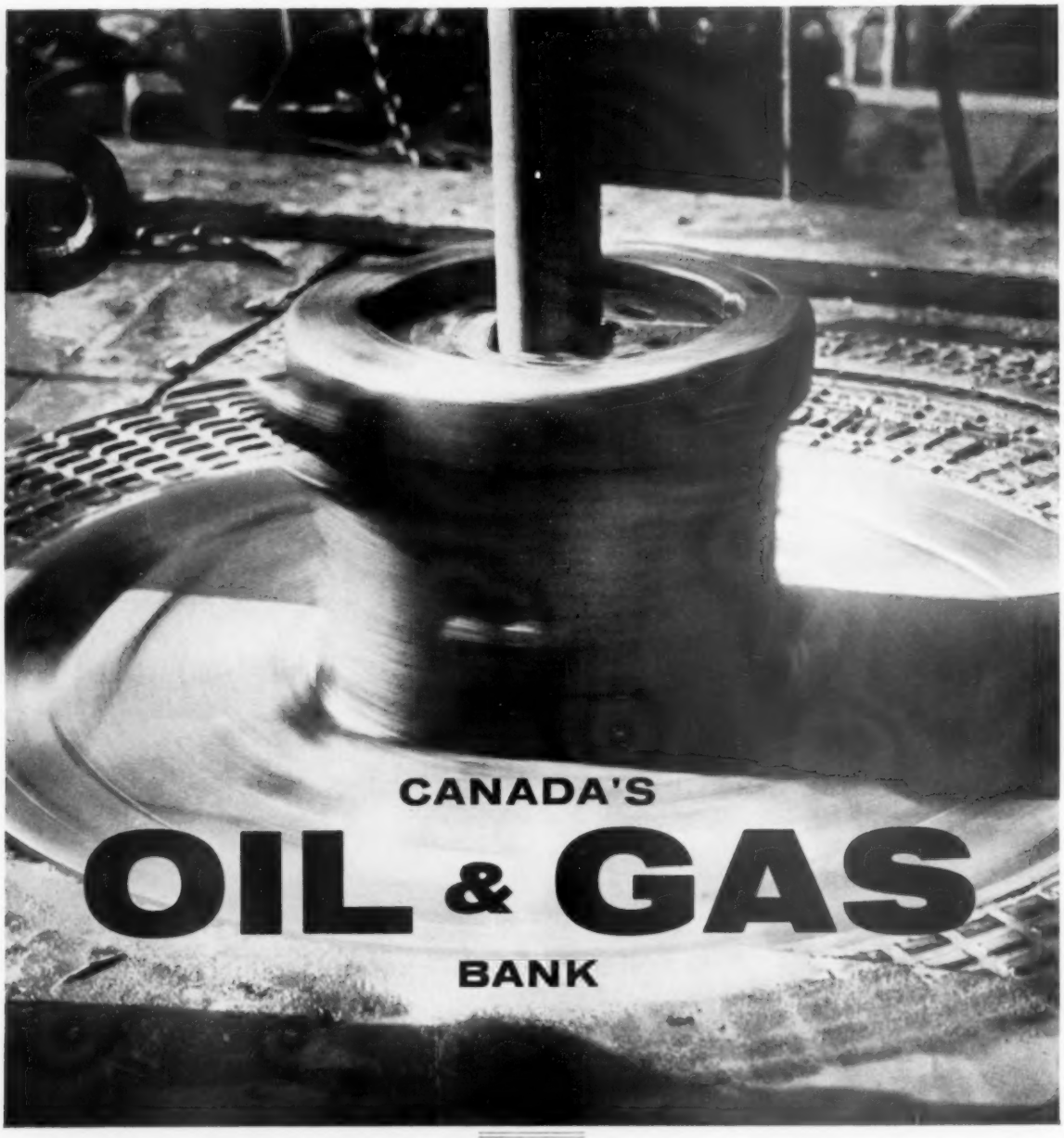

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Crude Price Outlook Improving

- **Producers are optimistic that upward adjustments may be made by areas, ending the long period of erosion in field postings.**
- **The optimism is based primarily on the sharply increased refiners' margins in 1961, coming on top of a strong final six months of 1960.**

There is growing optimism among producers that some increases may be made in crude prices. A general advance in postings is not anticipated, but rather selected boosts for specific types and areas.

The feeling springs from the level of improved earnings in the industry—both the reported data for 1960 and the expected strength that will be reported for the first quarter of this year.

A good part of the anticipated early-1961 earnings will result from the unusually strong demand for heating oils. But producers are noting that in the first month of the year demand for gasoline was running 2.5% over 1960, despite poor driving weather in many parts of the U.S.

Total demand for the month was up 6.4%.

Producers' optimism stems primarily from the improved level of refiners' margins, now the highest since the fall of 1957.

Refiners' margins—the realizations from products sold over the prices paid for crude—averaged $1 a bbl. in January. With four increases in distillate prices in the first two months, indications are that final data for February will show much higher margins.

Preliminary data show that Gulf Coast refiners' margins moved up to $1.15 in February, an all-time high even topping the Suez Canal shutdown period.

The $1-a-bbl. average for January for all U.S. refiners compares with a 75¢-a-bbl. margin in January, 1960, and with an average of 84¢ a bbl. for all of 1960, according to the tabulations of the Independent Petroleum Assn. of America.

The margin reached a 1960 low point of 72¢ a bbl. in May. But with tight controls on crude allowables in some states and restraints by refiners on runs in the last part of the year, the over-all margins averaged 93¢ a bbl. in the final six months of 1960.

The improved position so far indicates that the average margin for all of 1961 will top this figure.

Estimates of an increase in demand for domestic crude this year, amounting to about 3% over 1960, add to the optimism.

That would mean that production for the year would average 7,250,000 b/d. This assumes that the permissive level of imports will follow the pattern of 1960, which is now generally anticipated regardless of the review of the program that will be made.

Support for the producers' optimism also comes from indications that the Texas Railroad Commission, in particular, plans to keep a tight rein on allowables.

The Texas regulation agency has indicated in setting allowables so far in 1961 that it wants to prevent unnecessary buildups in crude and product inventories, by holding the permissibles in line with seasonal demand.

As a move in that direction, the commission has decided against calling for company estimates on industry-wide desired stock levels this spring, as it has done in former years.

Instead, the commission is sticking to its requirements that all purchasers of Texas crude report periodically on their individual inventory positions, their desired positions, and their refinery runs.

In addition to that data, which must be reported in time for the March statewide hearing, when top company executives must appear, the commission has requested reports from all purchasers on their shipments of crude into Texas from foreign sources and from other states.

Some upward adjustments have already been made in crude postings, which some producers and purchasers say is an indication of what may be expected to occur more widely this year.

Earlier this month, Continental Oil Co. discontinued separate postings for low-gravity, asphalt-type sour crudes in the Rocky Mountains.

Under its new schedule, those crudes are posted with higher-gravity oils, bringing an 8¢-a-bbl. upward adjustment for 10,000 b/d.

In California, Union Oil Co. made an upward adjustment of from 3¢ to 9¢ a bbl. for crude from the Beverly Hills and Culver City fields.

The most significant area in which producers now expect upward adjustments to be made is West Texas.

Demand for Permian Basin crudes has been extremely strong for several months, with some companies admitting that it is their most profitable oil at the refinery.

Should a price increase come, it may be initiated in West Texas and spread to other areas.

Postings for Permian basin crudes generally were raised less than the rest of the U.S. when the last general increase was made in January, 1957.

And prices in the area have eroded more in the downward trend of postings since.

Any upward adjustment in domestic crude prices, no matter how small, would serve as a stimulant to one of the most depressed segments of the petroleum industry—drilling.

Rotary rig operating in the U.S. are off around 10% so far this year, and a stimulant is needed to keep this segment solvent.

However, completions in the past two weeks have been around 6% ahead of last year, with the greatest emphasis being on wildcats for both oil and gas.

One deterrent in the over-all optimistic picture is the weight of the price cuts made in the Middle East last year.

The Middle East governments, through the creation of the Organization of Petroleum Exporting Countries, are still unhappy with the reductions.

This uneasiness makes it hard for the companies to raise domestic prices and still justify their actions in the Middle East.

Domestic producers, however, see no reason why they should be penalized simply because of the pricing patterns abroad.

The impact of compacts:

124-Million Bbl. of Gasoline

Motorists' switch to compact cars will cost the industry some 124-million bbl. in motor fuel demand between now and 1970, as larger automobiles give way to models that consume less gasoline.

Total car registrations will increase an estimated 25-million, to 86-million, over the next decade, according to industry estimates. But the increase in compact-car registrations will be an anticipated 33-million.

The net effect is to push 8-million of the "thirstier" engines off roads.

Estimates of gasoline consumption are based on three premises: (1) that a compact car consumes approximately 12 bbl. of gasoline a year, (2) that a standard model burns 15.5 bbl. of fuel a year, and (3) that average mileage per passenger vehicle is 10,000 mi. a year.

The growth in gasoline demand will feel its worst bite this year, when the decline rate for larger cars hits its peak—1.2-million units.

Industry economists figure that 3.2-million compact cars will be registered in 1961. But the scrapping of old standard automobiles will hold the net gain in gasoline consumption to only 9.9 bbl. per unit.

Without the encroachment of the lower-gasoline-consuming compact cars on the nation's highways, net new registrations in 1961—2-million units—would have accounted for an additional demand of 31-million bbl.

The impact of the compact on the growth rate for motor fuel demand will dwindle gradually, as the gap between net increase in new compacts registered and net gain in total registrations narrows.

When compact cars begin to replace compacts, the growth rate in gasoline demand should show some improvement.

That should begin to be evident in 1966, with gasoline demand increasing at an annual rate of 2.8%, compared with 1.7% in 1961.

California Gas Needs To Rise 148% by 1982

Stanford Research Institute believes Southern California's natural gas requirements will rise 148.8% by 1982.

The institute's projection was prepared for California Gas Transmission Co. in connection with a case pending before the California Public Utilities Commission on a proposed pipeline to import gas from South Texas and Mexico.

Stanford calculated that firm and interruptible gas requirements would exceed 4.4-billion cf/d in 1982, compared with 1960's 1.7-billion cf/d.

This, the Stanford study said, means that there's room for both the California Gas pipeline project and that of El Paso Natural Gas Co., which, in a joint project with Colorado Interstate Gas Co., wants to deliver 470-million cf/d to Pacific Lighting System companies.

Jet Fuel Demand Will Soar Over Avgas

Kerosine—the industry's oldest refined product and almost a "has-been" until a few years ago—has taken on new significance as a fuel for the rapidly expanding fleet of jet planes.

Kerosine was displaced by gasoline as oil's No. 1 product shortly after the turn of the century, when the automobile came into popular use.

But today, in the field of commercial jet fuel, kerosine is rising to major importance.

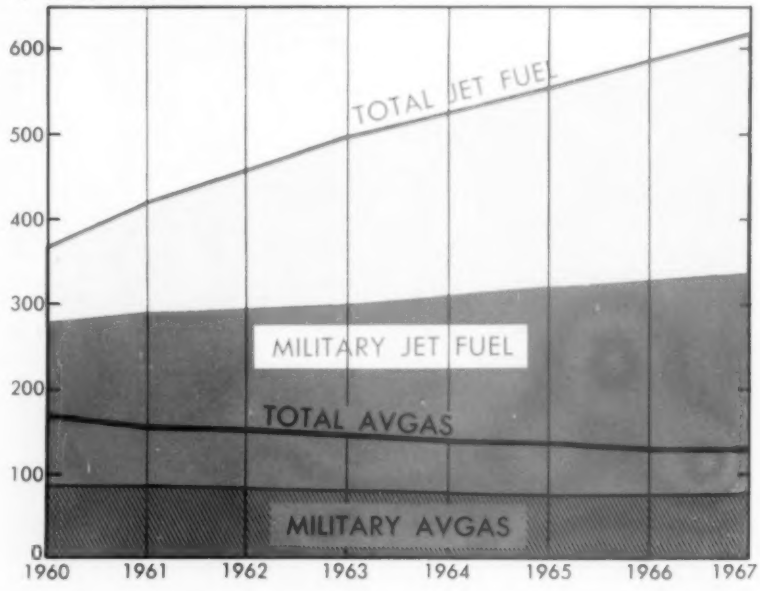
By 1967, demand for kerosine-based commercial jet fuel will have skyrocketed 283,000 b/d, or at a compound rate of 37.6% over 1958, according to industry estimates.

Demand for gasoline-based jet fuel, used primarily by the U.S. Air Force, along with a few commercial airlines, will also grow, but at a much slower rate—2.3% compounded.

In contrast, demand for aviation gasoline for piston engines will slump noticeably as the big airline users continue their trend to jets.

Civilian demand for avgas is expected to decline by 69,000 b/d, or an annual rate of 9.6% over the nine year period.

Military demand for avgas will decline less sharply—a drop of 25,000 b/d by 1967.



The brisk demand for kerosine-based jet fuel may pose problems later, some processors caution.

There is no way to increase kerosine production except to bump crude runs. Therefore, refiners say, demand for kerosine-based jet fuel may grow faster than the industry can produce it.

Phillips Devises Fingertip Control of All Inventories

Phillips Petroleum Co. is putting the finishing touches to a 26,000-page catalog that will give it fingertip control over everything it has stored in all of its warehouses.

It will take another six months or so to complete the task that was started back in 1956. But when it's done, Phillips expects to have a materials and spare parts catalog that will have few—if any—peers.

Thousands upon thousands of items in 16 major warehouses and 100 or more smaller supply points are indexed in the catalog—and, despite the formidable number of pages, it will be easy to handle and use.

This is being accomplished by putting each category in a looseleaf binder. Thus, at any given time, employees will work with only small sections of the over-all listings.

Phillips estimates that first-year savings alone—primarily from better utilization of maintenance time and reduced inventories—will pay for the project's costs.

At first it was felt that the savings in maintenance time alone were sufficient to justify the large expenditures involved in the project.

But once it got under way, a Phillips spokesman says, other savings also became apparent.

The company now estimates, he says, that better purchasing and warehousing practices, including reduced inventories, will result in greater savings than had been anticipated for maintenance time.

Phillips regards the catalog as a management tool for use in purchasing, warehousing, accounting, design, construction, operations, and maintenance.

These are the primary objectives:

- To establish a uniform numbering and description system that would identify all materials quickly;
- To encourage standardization of materials and promote interchangeability of parts;
- To eliminate purchasing of duplicate items under various names and manufacturer designations;
- To facilitate transfer and use of surplus stock.

In compiling the catalog on a companywide basis, Phillips found numerous examples of inventory duplication.

A check of one operating department, for example, disclosed that one district had 81 similar bearings in stock. An evaluation indicated that 12 would suffice.

Another department in one plant was found to be carrying 42 similar pump shafts in its inventory. An analysis showed that six were necessary.

"Under the old method of ordering," a Phillips department head explained, "we were purchasing specific parts of equipment designated by the manufacturer's serial number and description. We were therefore unable to take into consideration the fact that many items were interchangeable."

Basically, the catalog presents repair parts for each piece of equipment in description order, with a corresponding numerical sequence of stock numbers to start the material-procurement procedure (illustration).

This arrangement presents a clear-cut picture of a variety of similar items, and makes interchangeability or substitution easily recognizable.

Each stock number contains eight digits. Only one number is assigned to any given item, and that number is used for no other piece of material.

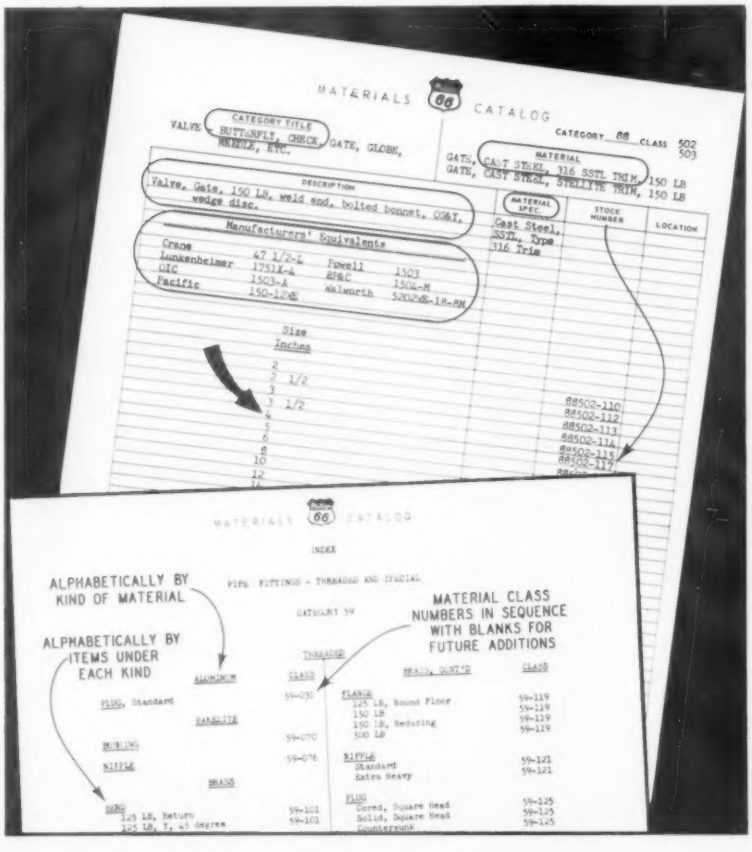
The first two digits represent the category number. The next three are the class number, the purpose of which is to provide a means whereby material in a particular category is segregated by type, shape, composition, or other physical feature. The final three digits refer to the item itself.

Looking down the road, the company feels that computer control of inventories, as a result of its numerical coding, ultimately will be the most significant result of its catalog.

Reports one spokesman: "With the rapid development of the cataloguing program, it has become apparent that all other benefits will be secondary to the possibilities opened for machine control of inventories.

"The catalog is the key to automatic data processing, since it involves a numerical coding system, which is easily converted into machine language."

He says that use of IBM cards make it possible now to locate materials at warehousing points throughout the country in a matter of minutes, instead of hours or days.

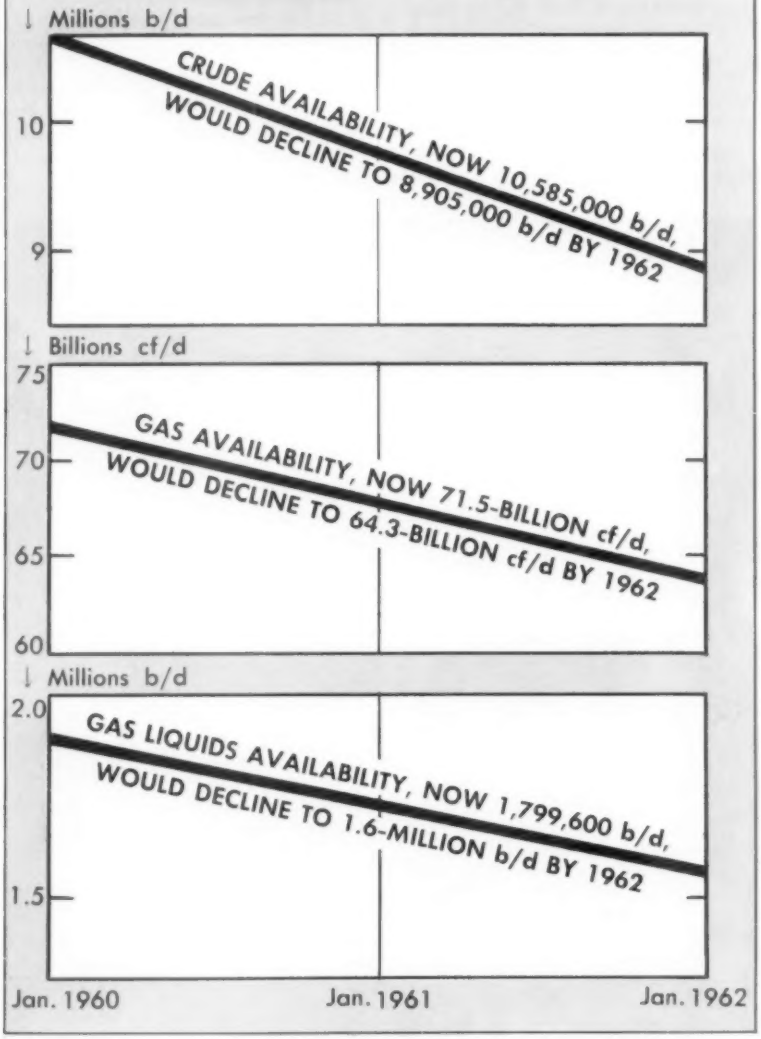


Productive Capacity Gain Has Been

What Does Drilling Mean?

"Productive capacity could not be sustained for more than a brief period without further drilling."

If production were at capacity and no drilling or other stimulating measures take place, productive capacity would decline as follows:



The domestic productive capacity of liquid and gaseous hydrocarbons has continued to increase, but the growth in recent years has been slowed considerably by the reduction in drilling.

That finding is one highlight of a preliminary report of a National Petroleum Council committee on proved petroleum and natural gas reserves and availability. The committee, headed by L. F. McCollum, president of Continental Oil Co., submitted a progress report on its work at last week's NPC meeting in Washington.

The comprehensive report, undertaken at the request of the government, will not be formally submitted to NPC for approval until next month. The committee requested more time at last week's meeting to finalize its study.

Crude productive capacity as of Jan. 1, 1960, the cut-off date of the National Petroleum Council study, amounted to 10,585,000 b/d; natural gas liquids capacity totaled 1,799,600 b/d; and natural gas producibility was 71.5-billion cf/d.

The new study showed that productive capacity of crude increased by 718,000 b/d since the previous study was made for January, 1957. The annual rate of gain in the three-year interval was 239,000 b/d.

Productive capacity in the three years declined in Districts 1, 2, and 5, and increased only slightly in District 4 (table, page 15).

The annual increment in District 3 between January, 1957, and January, 1960, was less than half the rate during the 30-month period between the previous studies, and was the lowest rate of gain since NPC started its studies in 1951, the committee reported.

The committee emphasized that the estimates of crude productive capacity "deal only with the quantities that could be produced from known fields through existing wells without regard to possible limitations of transportation and other facilities."

In the case of gas, no limitation was placed on estimated productive capacity because of inadequacy of market or lack of capacity of compressors, gathering systems, or pipelines.

For natural gas liquids, the estimated productive capacity represents the volume that would have been recoverable if production of crude and natural gas had been at capacity on Jan. 1, 1960.

Slowed by the Decline in Drilling

The crude productive capacity, the NPC study committee reported, could not be sustained "for more than a brief period," without more drilling.

The committee attributed the reduced rate of increase in productive capacity since January, 1957, to the reduction in drilling that has occurred since 1956.

"In spite of the reduction in drilling and reduced rate of increase in productive capacity, there was a substantial net gain of productive capacity relative to production representing a net increase of spare productive capacity from 1957 to 1960," the committee found.

Using the assumptions that production after Jan. 1, 1960, would be at capacity, and that no drilling or stimulating measures would occur after that date, the committee estimated that crude productive capacity would have declined to 9,694,000 b/d by last Jan. 1, and would further decline to 8,905,000 b/d by Jan. 1, 1962.

It would be necessary to drill between 40,000 and 50,000 holes a year to maintain the Jan. 1, 1960, productive capacity of crude to next January if production had been at capacity, the committee said.

"In arriving at the estimate of the number of wells required to maintain productive capacity," the committee reported, "it was noted that the district subcommittees estimated that in several states the number of wells likely to be drilling during 1960 and 1961 would not be adequate to maintain productive capacity at the Jan. 1, 1960, level.

"Such was the case of Arkansas, Utah, Colorado, and California."

In an emergency, the amount of drilling required to maintain capacity could be modified by applying other alternatives, the group noted.

Such modifications, the committee explained, would include changes in spacing, shifting drilling from less productive to more prolific areas, and employment of measures for stimulating production.

Steel and other essential materials would be required for drilling and for production equipment, both for maintenance of production and for development of new productive capacity to offset the decline of existing fields.

Crude productive capacity, the committee found, has increased more rapidly than proved reserves since 1953, but the relative increase in annualized productive capacity since 1957 "was small."

The annualized productive capacity (daily productive capacity projected to an annual basis) for the U.S. on Jan. 1, 1960, amounted to 12.2% of reserves, compared with 11.8% three years earlier and with 9.7% on Jan. 1, 1953, the study showed.

The increase during the 1957-1960 period was accounted for almost entirely by a gain in District 3, with all other districts showing slight declines, or holding steady.

"The continued increase in crude productive capacity relative to reserves in District 3," the committee reported, "probably reflects the continued intensive development in that area through multiple completion of wells, hydraulic fracturing, waterfloods, pressure maintenance, and other measures for accelerating or stimulating recovery."

But there is a strong note of warning in the committee's findings:

"If for any reason, the level of proved reserves should decline materially, productive capacity would decline also."

Putting it another way, the NPC committee reported that to maintain productive capacity, it is necessary to maintain the underground inventory.

The committee's study, based on data through 1959, placed ultimate recoverable crude reserves at 91.4-billion bbl. originally in place in all fields discovered through 1954.

Natural gas liquids reserves were estimated at 10.4-billion bbl. and recoverable natural gas reserves were put at 419.1-trillion cu. ft.

The study, similar to one made in 1944 by the Petroleum Administration for War, reviewed the ultimate reserves assigned to all fields in the light of current recovery techniques that may not have been in use at the time of discovery, and from additional reservoirs in older fields.

The committee is optimistic for greater recovery of oil from old fields. It predicted that a study made 15 years from now may show 125-billion bbl. of recoverable crude in fields found through 1954.

That estimate assumes that the same proportional increases will occur in the next 15 years as have taken place in the 15 years to 1960.

Crude productive capacity has increased faster than reserves

	Dist. I	Dist. II	Dist. III	Dist. IV	Dist. V	Total U.S.
Estimated Proved Reserves (Million bbl.)						
Jan. 1, 1951	204	2,926	17,091	1,313	3,734	25,268
Jan. 1, 1953	212	3,392	18,934	1,564	3,854	27,961
July 1, 1954	191	3,851	19,414	1,893	3,904	29,253
Jan. 1, 1957	226	4,300	20,017	2,120	3,772	30,435
Jan. 1, 1960	199	4,188	21,282	2,288	3,762	31,719
Estimated Productive Capacity (Thousand b/d)						
Jan. 1, 1951	54	1,083	4,161	350	1,079	6,727
Jan. 1, 1953	49	1,238	4,686	394	1,098	7,465
July 1, 1954	43	1,380	5,224	561	1,123	8,331
Jan. 1, 1957	37	1,591	6,613	615	1,011	9,867
Jan. 1, 1960	29	1,555	7,331	664	1,006	10,585
Annualized Productive Capacity (Percent of Reserves)						
Jan. 1, 1951	9.8%	13.5%	8.9%	9.7%	10.6%	9.7%
Jan. 1, 1953	8.5	13.3	9.0	9.2	10.4	9.7
July 1, 1954	8.2	13.1	9.8	10.8	10.5	10.4
Jan. 1, 1957	6.0	13.5	12.1	10.6	9.8	11.8
Jan. 1, 1960	5.3	13.6	12.6	10.6	9.8	12.2

Choosing an Antioxidant?

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Naval Stores Department
HERCULES POWDER COMPANY
900 Market Street
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What's New / IN THE INDUSTRY

The Federal Power Commission believes the use of gas for conservation needs is more important than its sale in interstate commerce. The commission approved the finding of an examiner who authorized Pan American Petroleum Corp. and Ohio Oil Co. to abandon sales to Montana-Dakota Utilities Co. in a precedent-setting case (PW—Nov.25'60,p13). The two companies said the gas was needed for secondary recovery of oil. The examiner ruled that the public interest is not limited to consumers, but embraces the ultimate recovery of oil, the various royalty owners, and the state and federal governments.

•

Gasoline and diesel fuel taxes in Pennsylvania are going up 2¢ per gal. Apr. 1. Gov. David L. Lawrence signed a bill last week raising taxes on both fuels to 7¢ per gal. The increases are expected to yield about $74-million for highway work. Gov. Lawrence also signed a bill expanding the borrowing power of the State Highway & Bridge Authority by $300-million.

•

The Interior Dept. will hold a hearing on residual fuel allocation procedures next Monday. The hearing on resid is part of the over-all review of the mandatory import control program that Interior Secretary Stewart L. Udall promised shortly after taking office. The review, Udall said, will include a study of the changes made in the resid program by former Secretary Fred A. Seaton, which extended eligibility for quotas to deepwater terminal operators on the East Coast. Udall said that, since a study of the hearing data will take time, the rule requiring import quotas to be made 45 days in advance of the next allocation period has been suspended, since that would have required making resid import allocations for the April-June period by Feb. 15.

•

Louisiana granted a request this week for retroactive application of bonus allowables in the Opelousas field as a wider-spacing incentive. The Conservation Commission's approval of the request made by Tidewater Oil Co. and Colorado Oil & Gas Corp. marked the first use of its power to backdate the effective date of bonus allowables (PW—Feb.10'61,p19). The two companies based their appeal on the fact that they had drilled on an 80-acre pattern, even though development began before the commission issued its basic bonus order for the Thompson (Frio) sand pool.

•

Not all oil companies fared equally well in 1960: A few minus signs have crept into earnings reports. Sunray Mid-Continent Oil Co. estimates its net profit for the year at $41.1-million, down 6.2% from 1959. Standard Oil Co. (Ky.) had a 6.4% decline in 1960 earnings, to $13.8-million. Gulf Oil Corp., on the other hand, reports its highest net from operational revenues in history—$330-million, up 13.8% over 1959.

•

Pure Oil Co. is taking on a five-year development project in Alaska. It signed a contract with the Interior Dept. for exploration on nearly 500,000 acres of remote and barren country in the Nushagak Bay area, north of the Alaskan Peninsula and 300 mi. southwest of Anchorage. During the five-year period, Pure is required to drill at least three exploratory tests, and to spend not less than $1,175,000.

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Looking Ahead in Washington

McGraw-Hill
Washington
Bureau
February 17, 1961

API will start to take the lead more on issues in Washington. The plan is to make haste slowly, but API President Frank Porter intends to spend more time in the capital. The aim is to have a prominent industry spokesman on hand to speak on as many issues as possible. This role was discussed with former Sen. J. Allen Frear of Delaware. But nothing developed from the talks.

A larger role for API is welcomed by Washington representatives of some companies. With some vital questions coming up that will affect the entire industry, a top spokesman is essential, they say. "The coal boys know just what they want, and we've been letting them have it by not acting together," one says. Another remarks: "Interior Secretary Stewart L. Udall has shown he is eager to meet us half way, but he's going to get fed up fast if this means settling fights in the industry all the time."

•

President Kennedy's choices for the Federal Trade Commission signal a powerful role for the agency. Paul Rand Dixon, to be chairman, is known for his administered price investigations for the Senate antimonopoly subcommittee. Another member, Philip Elman, former assistant to the Solicitor General, has handled many antitrust cases. A. Everette MacIntyre, scheduled to be a commissioner by September, is a veteran antitruster with 25 years on the FTC staff. Rep. Wright Patman (D., Tex.) backed MacIntyre, and Sen. Estes Kefauver (D., Tenn.) wanted Dixon. Since only one Democrat could be named immediately, Kennedy said MacIntyre would get the next opening. Elman is an independent politically.

Administered prices are bound to get close scrutiny. But they insist that mere similarity in pricing won't be taken as a sign of weak competition. What Dixon will look for, FTC lawyers say, is situations in which market leaders with great economic power are followed in pricing by weaker companies. The oil industry can expect strict enforcement across the board, but no anti-oil campaign, under Dixon. Staff sources hint that other industries would be the likeliest first target.

Some key oil company cases before FTC will be decided by the new majority. Among them may be the restraint-of-trade charges against Texaco Inc., Atlantic Refining Co., and Shell Oil Co. in handling sponsored tires, batteries, and accessories. The cases have been argued before the commission, but may have to be reargued for the benefit of the new members.

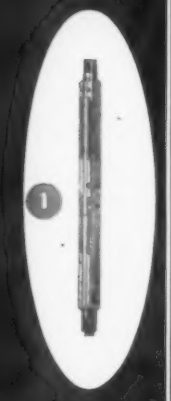
•

There will be no big shift in control over the regulatory agencies from Congress to the White House. Congressional leaders balked at giving up authority, and Kennedy won't insist. For one thing, he has backed away from the idea of a White House office to oversee the agencies. This was suggested by James M. Landis, the President's advisor on regulatory problems. Kennedy had little to gain from a fight with Congress over jurisdiction.

•

Some Republican opposition to Joseph C. Swidler as chairman of the Federal Power Commission is developing. Republican senators remember the difficulties Democrats gave the present chairman, Jerome K. Kuykendall, over confirmation.

IN SLIM HOLE DRILLING



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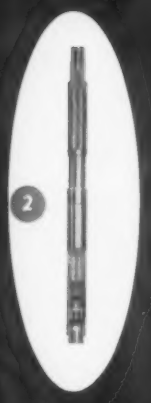

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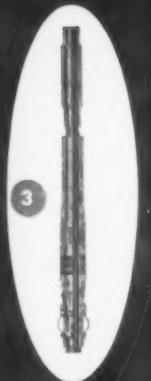

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Federal Offshore Leases Pose Problems

The big question is: Should production from federal offshore leases be granted higher allowables?

Louisiana will be the battleground if a clash develops over the issue of how production should be prorated from federally controlled offshore leases.

Under the temporary compromise arrangement now in effect, leases off Louisiana are handled this way:

- Zone 1—The band extending 3 mi. from the Chapman Line designation of the shoreline: Leasing and all regulation strictly in state hands.
- Zone 2—The strip between the 3-mi. and 3-league (around 10½ mi.) lines: Leased by the U.S. in agreement with the state on tracts to be offered. Revenues to the U.S. and placed in escrow.
- Zone 3—The area between 3 leagues and the Perez Line (which follows the Coast Guard Line where oceanic rules apply to marine traffic); in some places this outer line is some 30 mi. from the shoreline: Leasing entirely up to the federal government. Revenues placed in escrow.
- Zone 4—From the Perez Line out to edge of the Continental Shelf (around the 600-ft. water-depth line): Strictly federal.

Production in all four offshore zones currently is regulated in accordance with state rules.

These rules provide somewhat higher allowables for offshore production than is accorded onshore production. Provision also is made for making up production lost to bad weather, and the like.

The U.S. Geological Survey supervises operations on federal leases that have been awarded by the Bureau of Land Management.

It seems safe to assume that Louisiana, and the rest of the "3-mi. coastal states," won't get more than the 10½-mi. strip secured by Texas and Florida, in any event. There is, of course, the matter of fixing exactly the location of the shoreline.

When the years-old, federal-state ownership hassle is ended, the basic reason for the current federal-state arrangement will cease to exist.

The question is: Will that also alter the regulation of production beyond the state's line of authority?

Federal officials presently are following a policy of full cooperation with state officials, and seem far from eager to change it. At the same time, they feel certain they have complete authority over all operations on U.S.-controlled leases.

"Offshore production on federal leases continues to be in conformity with state regulations and rules," says one official. "We're hoping there won't be any great change after the final (jurisdictional) ruling. We're hoping it just means that we take over part of the work now handled by the state.

"But there isn't any question about the authority. We have all we need to control all operations on federal leases, including production to insure against physical waste."

Federal employees, rather than state, actually supervise operations in two of the zones off Louisiana now.

Originally, employees of the Louisiana Dept. of Conservation did this work. But following U.S. Supreme Court decisions, there was a question as to whether such employees could be covered by their insurance if working in Zones 3 and 4, so their activities now are confined to the first two zones.

Once the current jurisdictional controversy ends, there is a chance that pressures will start to mount for higher allowables for federal leases. The push could originate from two sources: (1) some offshore operators; and (2) from Washington.

By and large, operators have contended all along that their allowables are much too low, considering the size of their capital investment and the operating costs offshore.

At the same time, pressure is almost bound to come from Capitol Hill, sooner or later, to increase federal revenues by boosting federally controlled submerged lands production. Now a few inland state legislators have stated plainly in the past that they feel certain producing states' regulations are market control, rather than conservation, measures.

Bouwe Dkystra, Shell Oil Co. vice-president, recently advocated the lifting of all restrictions except good management, and avoidance of physical waste on all Zone 4 production.

Dykstra told a New Orleans meeting of the Delhi Section, Society of Petroleum Engineers, American Institute of Mining, Metallurgical & Petroleum Engineers:

"I am specifying Zone 4 because this is the area controlled by the federal government, not in dispute, and it is located in deeper waters.

"The federal government is the sole owner of the subsoil rights of the deeper waters offshore.

"The U.S. Geological Survey has the supervision of the operations. I understand they have all the authority to see to it that these operations are carried out to the best interest of the one lessor—the federal government."

Dykstra reasons this way: First, there is the huge cost of offshore operations, and the almost certain promise of bigger expenditures as the industry moves into ever deeper waters.

Noting that tremendous outlays have gone into leases, seismic work, drilling and equipping wells, production and transport facilities, and royalty payments, Dykstra added: "I think that one has to come to the conclusion that, even today, the income . . . from offshore production is insufficient to pay for operating expense and capital. The cash flow is negligible. There is no money coming back from these offshore operations."

He noted that only a limited area of Zone 4 can be developed with existing drilling equipment, and at very high cost. For most of the area, he said, new types of equipment will have to be constructed, and a completely new approach made to well controls.

Because of these and other factors, he added, "the commercial incentive is needed to build the equipment for full scale operations."

Secondly, Dykstra continues, the offshore industry is hampered by restrictions that were necessary onshore, but not offshore.

He termed the "natural causeway" formed by the Mississippi River over the Continental Shelf "one of the most attractive areas to search for oil in the North American Continent." He acknowledged that the crude and gas reserves already found are sizable, and that the state-federal dispute hasn't hindered the "technical side of the operation."

But, he added, "We carried offshore not only our technical know-how of onshore operations, but also

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(2) Note that the *Hold-Down* is a part of the packer, not attached to the mandrel... leaving the bypass valve free for instant pressure equalization.

(3) Note that a *Differential Lock* holds the bypass valve closed without requiring high set-down weights... yet can be instantly released by picking up on the tubing.

The new concept in long-stroke packers is fully explained in Bulletin 385. Write: Baker Oil Tools, Inc., P. O. Box 2274 Terminal Annex, Los Angeles 54, California

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Save with Ford T-Series Super Duty Tandems for exceptional durability, big payloads and low operating expenses. Ford T-850 and T-950 Tandems with Super Duty V-8 engines have rugged double-channel, hi-tensile frames for maximum strength, minimum weight. And they provide a wider range of chassis options so you can choose the right power train and load-carrying components for any job. Eaton and Timken rear axles are now available in bogie assemblies with up to 38,000-lb. capacity. And lightweight aluminum walking beams, wheels and gas tanks are available to keep chassis weights low . . . payloads high.

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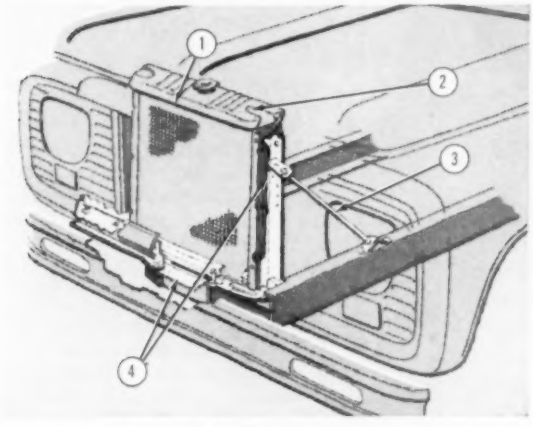
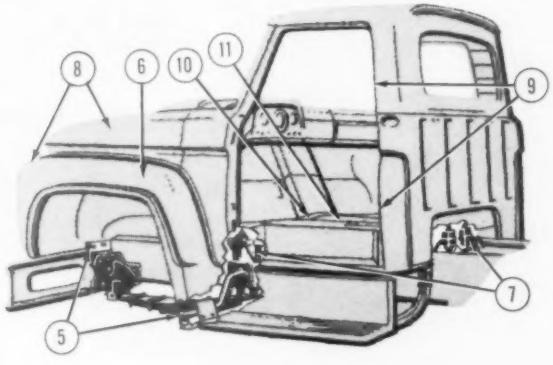
SAVE WITH NEW HEAVY-DUTY CONSTRUCTION THAT DOUBLES CAB, SHEET METAL AND RADIATOR LIFE





(1) **Save with Ford's exclusive "lock-seam" radiator construction** that doubles the solder area at key seams for greatly increased strength and longer radiator life.

(2) **Save with heavier-gauge metal on radiator tank and header.** Upper and lower tanks and header have thicker walls to resist vibration, jolts and corrosion for greater reliability.

(3) **Save with independent radiator mountings,** separate from front-end sheet metal. This means that road shocks, vibrations and shakes are not transmitted to the radiator through sheet metal . . . tanks, tubes and connections last longer, require less maintenance.

(4) **Save with "horse collar" mounting** seated on rubber pad for extended radiator life. This new mounting on resilient rubber at the center of frame cross member soaks up any frame flexing . . . cuts wear and tear on entire cooling system.

(5) **Save with independent fender mountings.** Fenders are bolted to a rubber-cushioned transverse bracket at the front and a frame-mounted bracket at the rear. This mounting, independent of both cab and radiator, eliminates stress transfers for greatly increased fender life.

(6) **Save with removable fenders.** The quick and easy removal of only 8 bolts per fender provides faster service accessibility to the engine area, saving valuable maintenance time.

(7) **Save with new 3-point cab mounting system** for greater cab durability. Two outboard front mounts plus a centered "twin" rear mount provide a triangular system that holds the cab stationary while allowing the frame to move independently . . . reducing strain on the cab.

(8) **Save with 42% heavier-gauge sheet metal** in fenders, hood, cab floor pan and toeboard for greater strength, greater durability.

(9) **Save with stronger cab construction.** New full-length door pillar reinforcements provide increased cab rigidity, stamina.

(10) **Save with a more solid foundation.** 42% thicker sheet metal is used in the integral floor pan and toeboard, this with added floor reinforcements gives a stronger base for longer cab life.

(11) **Save with new transmission access panel** to cut transmission service time.

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FORD DIVISION, Ford Motor Company

we took with us offshore conventionalities that grew up onshore and now have become a real hindrance in the offshore operations in deeper waters."

Such things as the protection of ownership and correlative rights, existing practices on spacing, proration, and the like, he added, were vital onshore, "to assure orderly development," and to avoid "wasteful practices."

He contended, however, that "the time has come for us to examine the basic premise and ask ourselves if it is necessary to take with ourselves to deeper waters offshore, unaltered, the restrictive measures that have become part and parcel of onshore operations."

Dykstra added that there is a "wastage" of offshore installations, which eventually must lead to wastage of oil and gas—"all due to restrictive measures that originated onshore and that have no place in the offshore operations in deeper waters."

Technological and managerial talent exists for an offshore oil thrust all the way to the Continental Slope and beyond, Dykstra maintains, if the incentive is provided.

He added, however, that "even if the incentive were available tomorrow, it still would take a couple of years before the effect of new equipment would be felt.

"The future tempo of offshore operations, in the final analysis, depends on actions by the federal authorities."

Few familiar with the situation expect any sweeping changes in offshore regulation. It's apparent, however, that unprorated offshore production could give onshore production a rough time.

"I won't say those offshore fields are in the Middle East class," says one oil man, "but some of them are giants compared to most onshore fields.

"It's a touchy problem. I'm familiar with the arguments for higher offshore allowables, but you've got to keep in mind the industry welfare onshore, too."

Several efforts have been made during the past few years to work out some solution. An industry committee and Louisiana officials are considering the problem currently, trying to arrive at some arrangement that is equitable.

The solution hasn't been found yet, and it is difficult to predict the outcome. Among the suggestions has been the setting, in effect, of "offshore import allowables" for the deeper-water production.

Meanwhile, the federal-state tussle is continuing. Congressional action on an extension of coastal-state boundaries will come this year. And there probably will be a Supreme Court move on the shoreline aspect, as well.

The congressional efforts will be concentrated on securing the same three leagues for Louisiana, Mississippi, and Alabama that the court decreed for Texas and Florida.

Several such bills have already been introduced, but the legislation carrying the states' real hopes probably will be drafted following hearings of a special House Judiciary subcommittee established to deal with the issue.

Rep. Edwin E. Willis (D., La.) is chairman and chief strategist. Willis says he intends to "move slowly" and is presently concentrating on "spadework and research." He won't discuss a timetable for the hearings, or even when his bill will be introduced, but says, "I firmly believe we can make out a case."

State strategy in Congress apparently will be constructed around the formulation and presentation of sound, logical arguments—as legislators see it, at least—rather than on flag-waving.

"The time has long since passed

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when we can indulge ourselves in demagoguery over states rights and equality," explains a Louisiana legislator.

"When we introduce a bill," he adds, "it will be a tight legal argument—as though we were appealing an unfavorable decision from the Supreme Court to a higher court—the Congress."

The approach probably will be that the court shut out Louisiana's historical evidence for its three-league claim and that the Submerged Lands Act provided a "vague deed" that had to be proved by such facts.

The high court is expected to handle the shoreline settlement by utilizing a special master as it did earlier for the California coast line.

None has been picked yet, but indications are that the court intends to name such a master. Just when isn't clear.

Automated Feeder Cuts Chemical Cost

An electronic-pressure system that automatically controls the amount of chemical injection is significantly cutting crude treating costs for Phillips Petroleum Co. in the Burbank field, Osage County, Okla.

The automatic controller was designed by Phillips' Research & Development Section at Bartlesville, and installed a little more than one year ago at a lease automatic custody transfer unit (No. 68) in the highly automated North Burbank Unit.

Phillips has operated an extensive unitized waterflood operation at North Burbank, for itself and several other companies, since late 1951. Oil produced from the Burbank Sand at a depth of approximately 3,000 ft. is a 38-gravity, Mid-Continent sweet, paraffin-base crude.

Chemical injection is required to promote the separation of oil-water emulsions, which have existed in the field since primary production days.

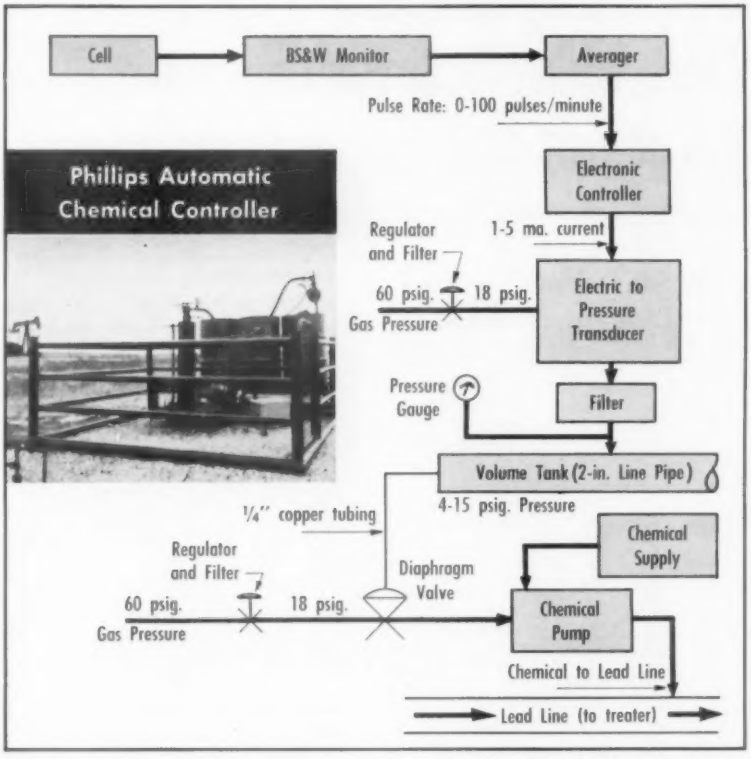
After chemical treatment, demulsification is further speeded by processing in conventional vertical-type treaters located at each ACT installation.

The secret behind chemical-cost savings is the automatic controller's ability to regulate chemical injection in direct relation to the amount of basic sediment and water entrained in the crude stream.

Chemical lubricators (injectors) of one sort or another have been used for years to introduce emulsion-breaking reagents into crude streams.

Systems have commonly consisted of a small tank container connected with the lead line through a tee, and equipment with suitable valve and sight-feed controls. An alternative device has employed a small, plunger-type pump to force-feed the chemical into the lead line.

Phillips' automatic system perpetuates the use of a pump, but with the important difference that chemical injection is regulated in accordance with varying crude conditions. Previously, lubricators had been designed to introduce a static volume of emulsion-breaking reagent into the lead line at a uniform rate.



SCHEMATIC shows Phillips Petroleum Co.'s self-regulating chemical injection system. Inset is field view of pump station, with supply drums of emlusion-breaking fluid.

As a Phillips' engineer has observed: "Our experience over the years has shown that bs&w content varies considerably over relatively short periods of time.

"Manually controlled lubricators, while effective, must be set at maximum injection values in order that pipeline specifications be met at all times. Consequently, the oil is overtreated a large part of the time."

During 1960 the automatic control system treated more than 1-million bbl. of crude at a cost of approximately 0.2 mills per bbl.

The average treating ratio at Unit 68 last year was one gallon of chemical per 985 bbl. of crude.

At a cost slightly more than $2 per gal. for the chemical, this represented a treating cost of 0.21 mills per bbl. of oil.

During the same period at seven other North Burbank units with manually controlled chemical lubricators, the average treating ratio was 1:791, representing a treating cost of 0.26 mills per bbl. of oil.

The difference between the costs of the two methods, 0.05 mills per bbl. of treated oil, represented a saving of $535 for the 12-month period ended Dec. 31.

Phillips' automatic chemical lubricator is set up to operate in close coordination with automatic custody-transfer facilities.

The lubricator and chemical storage tanks are located about 400 ft. upstream from the treaters, so that

Better Production Tools Through Research

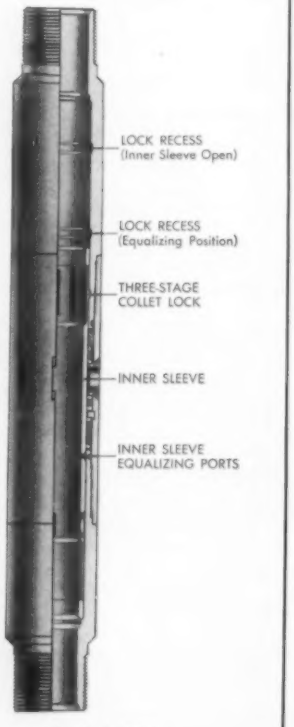
OTIS Equipment NEWS

Volume III, Number 1 **Otis Engineering Corporation • Dallas** *Production Equipment and Services*

Otis Sliding Side-Door Proves Most Versatile Circulating and Production Tool in the Field Today

Three Different Versions Solve Many Costly Production Problems

DALLAS — The Type A Otis Sliding Side-Door®, designed and introduced to the oil industry just four years ago, has become the most widely used selective circulating and production tool in the field today. Since its introduction, two modified versions — the Sliding Side-Door, with pump-out plugs and expendable shifting device, and the Sliding Side-Door Cross-Over — have been introduced.



TYPE A OTIS
SLIDING SIDE DOOR

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The Type A Otis Sliding Side-Door is a full-opening tool designed to provide a selective means of establishing a flow course between the tubing and annulus without killing the well, moving the tubing, or disturbing the packer setting. The tool is opened or closed by standard wire line methods and so designed as to permit any number of Sliding Side-Doors to be installed in a single string of tubing and any one or all opened or closed with a single run of the rugged, proven shifting tool. The Sliding Side-Door with pressure shifting tool may be run in on the tubing in the opened position and after circulating may be closed by pumping down an aluminum ball or drop plug.

Proven Design Features

According to the many operators using this equipment, there is an exclusive combination of features that makes the Otis Sliding Side-Door preferable for efficient well completion and economical production. These are: (1) Thoroughly proven in thousands of wells. The design and mechanical operation of the tool has several years of operating proof behind it — the producer can use the Otis Sliding Side-Door with confidence. (2) Positive indication of opened-closed sleeve position. The shifting of the inner sleeve of the Sliding Side-Door is accomplished by the rugged Otis Shifting Tool. This proven Otis Shifting Tool is an automatic self-releasing device that serves to indicate positive opening or closure of the sleeve. The inner sleeve also incorporates equalizing ports that are designed to permit equalization of abnormal pressure differentials when shifting the sleeve. (3) Outer sleeve design and construction combined with the clearance between the inner and outer sleeves have practically eliminated the metal-to-metal bind that makes shifting other tools often impossible. The Type A Otis Sliding Side-Door is designed to withstand the distortion forces of temperature, compression, tension, or torque and still be shifted. (4) Flow area through the sleeves of the Otis Sliding Side-Door is of ample size to permit desired fluid passage.

Versions for Special Application

The Type A Otis Sliding Side-Door with pump-out plugs and an expendable pressure shifting device provides additional blowout protection and cuts completion costs. This version of the Otis Sliding Side-Door permits the tree to be nippled up and drillable packers to be tested before unloading the well.

Another version is the Otis Sliding Side-Door Cross-Over which is designed to provide complete zone isolation while changing or removing cross-over chokes in single-string, dual completions.

All three Otis Sliding Side-Doors are available in a wide range of sizes — and all three Sliding Side-Doors are good examples of the cooperation of Otis' Well Completion Specialists and Engineering Staff in assisting operators to meet today's demand for economical well completion and production tools. Literally thousands of production problems have been solved by Otis over the past thirty years. Perhaps you are faced with a production problem Otis could help solve. If so, call your local Otis specialist today. For more information on Otis Sliding Side-Door equipment, call the Otis office nearest you or write Otis, Dept. E-1, P. O. Box 35206, Dallas 35, Texas. You'll find experienced Otis Well Completion Specialists ready to help you . . . anxious to serve you . . . and with the widest variety of field proven production equipment and services available today.

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turbulent-flow conditions in the moving oil will assure adequate admixture prior to mechanical treatment.

The lubricator's control system, located at the ACT unit, is activated by an electric signal received from the Phillips-designed bs&w monitor through an "Averager." The Averager, located also at the ACT unit, converts the bs&w value of the fluid stream into a pulse rate that can be read-out by the electronic controller.

Electric pulses are transmitted via buried cable at rates of from zero to 100 pulses per minute. These rates are calibrated to correspond to from zero to 1% bs&w content as detected by the monitor. Thus, the transmission of 20 pulses per minute respresents a 0.2% bs&w concentration in the crude stream.

The rate of treatment (the amount of chemical injected) is changed with each setting of a stepping switch, which is controlled by pulses from the bs&w monitor.

Each step of this switch controls the current to an electronic-pressure transducer. The transducer controls the gas pressure to a volume tank (4 to 15 psi.), which regulates a diaphragm valve. This valve in turn controls the flow of gas to the gas-operated injection pump. The purpose of the volume tank (a length of 2-in. line pipe) is to prevent surging.

The transducer operates on a signal that varies from one to five milliamps of electric current. This current is controlled by variable resistors—one for each of the eight steps utilized on the stepping switch. Each step corresponds to a 0.1% change in bs&w (from 0.0% to 0.8%), and can be set at any desired current.

A timing device allows the controller to be reset every 12 minutes. The injection pump then operates at the rate corresponding to the last bs&w reading on the monitor until the 12-minute cycle is completed.

Dual injection pumps were required for Phillips' first automatic chemical injecting system, but subsequent installations will utilize only one pump.

Two chemical pumps were used at Unit 68 because lead lines enter the battery from opposite directions.

ACT units installed during the past year, however, have been so modified that lead lines enter from one side only, permitting single-pump installations.

Phillips now has automatic lubricator controllers ready for operation at three more ACT units, and these will go on stream sometime this year.

In addition, the company currently anticipates that two more of the automatic devices will be installed next year, and as many thereafter as are required to keep pace with waterflood expansion. Chemical injection now is being handled manually at all units other than Unit 68.

A Phillips spoksman has noted: "To justify cost of installation, electronically controlled chemical injection systems must be located at batteries handling relatively large volumes of oil.

"All batteries at which future installations are anticipated will handle more than 3,000 b/d, affording a payout time of approximately 1.3 years on the initial investment."

No major difficulties have been encountered with installation of the automatic controllers, and maintenance costs have been negligible.

Phillips reports that optimum operating efficiency has not been achieved on the original two-pump installation because of the pumps' somewhat differing performance characteristics. This situation will be rectified, however, with installation of future single-pump units.

No significant maintenance problems or upkeep costs are expected for the automatic control systems, since the automatic injection system's transducers and tie-in controls will easily last the life of the ACT units which they serve.

1 OF 6 WAYS TO DRILL OFFSHORE

. . . and drill *economically* and *efficiently*. THE OFFSHORE COMPANY has a quarter-century of drilling experience, including 14 years in marine drilling. World-wide in scope, OFFSHORE will furnish the right combination of drilling unit, engineering and operations staff for *your* drilling situation.

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Second oldest of the 6 offshore drilling methods, the Tender and Platform are regaining a well-earned place in the industry, becoming more prevalent in deep-water operations. THE OFFSHORE COMPANY can provide this type of tool, including design and construction of dependable, minimum size platform if requested, for use in water up to 200 feet deep.

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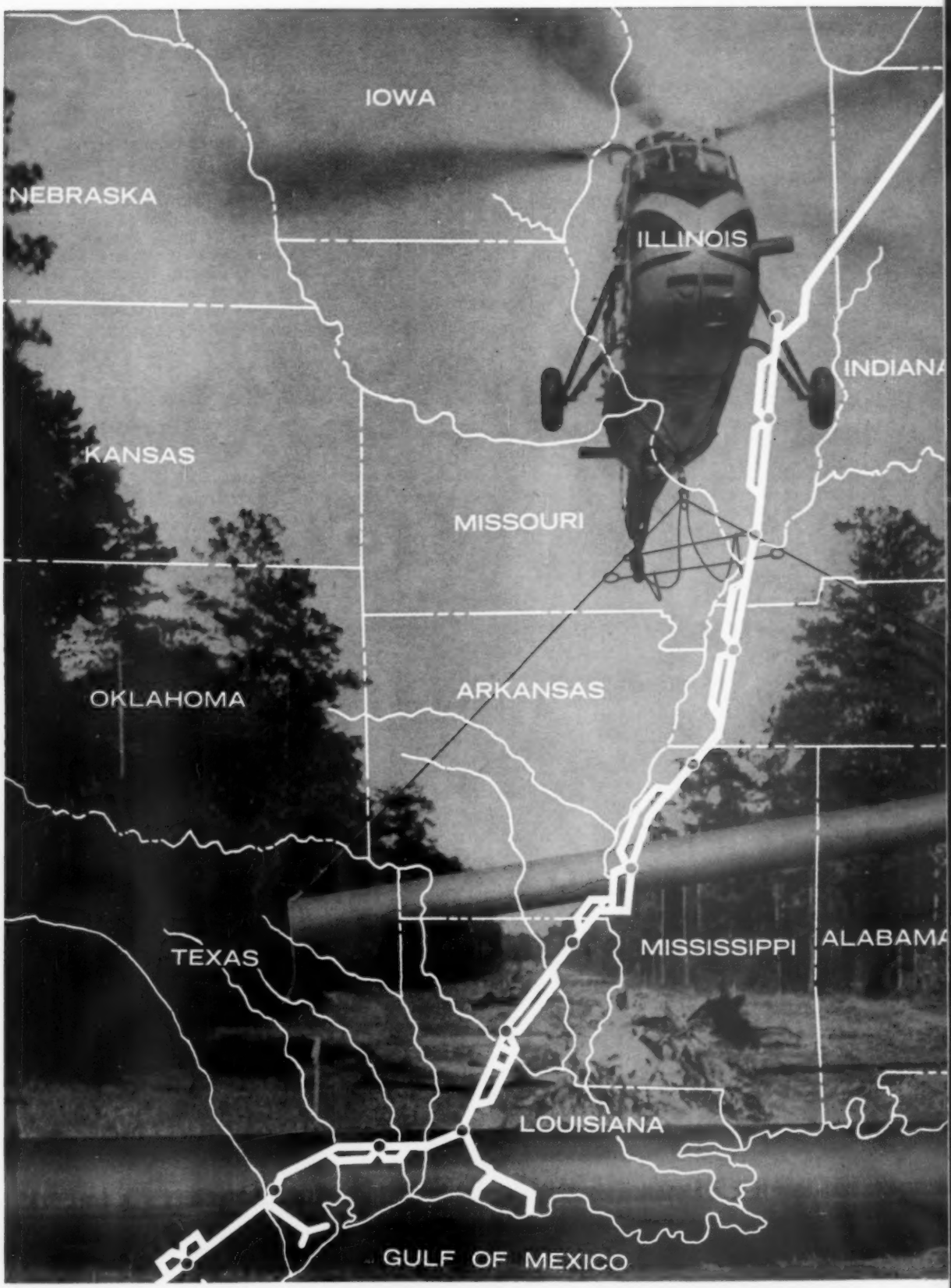
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"Pipe Lift" helps tie loops between Texas and Illinois... swells line by 135,000,000 cubic feet of natural gas per day

Linking the gas fields of Texas and Louisiana to Consumers Power Company of Michigan was the objective of Trunkline Gas Company's new pipeline project.

Besides main-line loop, the project also consisted of gathering lines in Texas and Louisiana and a main-line extension through Illinois and Indiana. Work began in August of 1959. Although progress was impeded by the steel strike, marshy terrain and a severe winter, the system was completed by June of 1960. Pipe stringing by helicopter was Trunkline's unique way of speeding up operations through some relatively inaccessible areas during the worst part of the winter weather.

A. O. SMITH supplied approximately 193 miles of 24-inch through 30-inch pipe for this important line.

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Tracer Marks Reservoir Fluid Flows

A highly accurate laboratory method of tracing what happens to oil, water, or gas in a reservoir during secondary recovery operations has been developed. It's called "micro-radioautography."

The method is a joint research effort of Mihir B. Roy, graduate petroleum engineering student, and Donald E. Menzie, associate professor of petroleum engineering, both at the University of Oklahoma.

Basically, the method involves the use of a radioactive tracer to delineate changes occurring in an oil reservoir when subjected to secondary recovery processes.

Its advantage: By adding radioactivity as a measurement tool, the researcher avoids inaccuracies inherent in methods dependent on measuring exceedingly small fluid volumes and reservoir sizes.

Explains Roy: "Photomicrography, previously used by others in studies of this nature, is applicable only to exceedingly small sections of the simulated reservoir at any one time.

"Individual pores must be identified with reference to their fluid content. The researcher sometimes finds himself in the position of being unable to see the forest for the trees.

"It was our reasoning, therefore, that use of an oil-soluble radioisotope might be the answer to the limitations necessarily imposed on photomicrography. And at the same time we now have a method that no longer requires close attention to volumetric fluid displacement as the only measurable factor."

So far, the Oklahoma University project has dealt primarily with the mechanics of setting up and carrying out studies on increased recovery through fluid injection.

"This particular project," reports Menzie, "is part of a continuing program conducted at the university since 1958. Through it we hope to learn more about the mechanics involved in secondary recovery processes through construction and use of observation cells in the laboratory.

"We believe that development of the approach we now refer to as micro-radioautography has brought us a step closer to our goal of accurately predicting reservoir behavior."

The radioautographic method uses an observation cell constructed of laminated glass to simulate the oil reservoir.

Two sheets of ⅛-in. glass were cut to equal dimensions of 9 x 2 in. Two strands of 0.004-in. copper wire were used to separate the glass sheets, and the void thus formed was packed with a monolayer of 20/30-mesh grains of crushed Pyrex glass. The glass sheets were then cemented together and sealed.

The simulated reservoir within the observation cell has an average porosity of approximately 40% and an average effective permeability of 9 darcys. Input and production wells are simulated by apertures fitted with valves at each end of the model.

Fluids are pumped into the reservoir to pressures of 5 psi. to 10 psi., just enough to displace the previous fluids. Injection rates are maintained at desired levels by applicable valving and a small screw-type pump driven by a .5-hp. electric motor.

Iodine 131 is the isotope used throughout the research project.

The material is a medium energy gamma radiation isotope having a half-life of 8.1 days. For purposes of their study, Roy and Menzie selected a pure Iodobenzene formulation containing I-131 incorporated into an organic molecule.

Designed specially for tracer-survey work, Iodobenzene is completely soluble in oil, but insoluble in both brine and fresh waters. It was obtained from Tracer Lab, Inc., Houston.

Conventional X-ray plates are used in microradioautography to detect ionized oil particles in the simulated reservoir.

Since the oil phase is rendered radioactive by the addition of I-131 prior to its injection into the reservoir, ionized oil particles cause a reaction of silver halide crystals contained on the X-ray plates, much as conventional photographic film reacts when exposed to light.

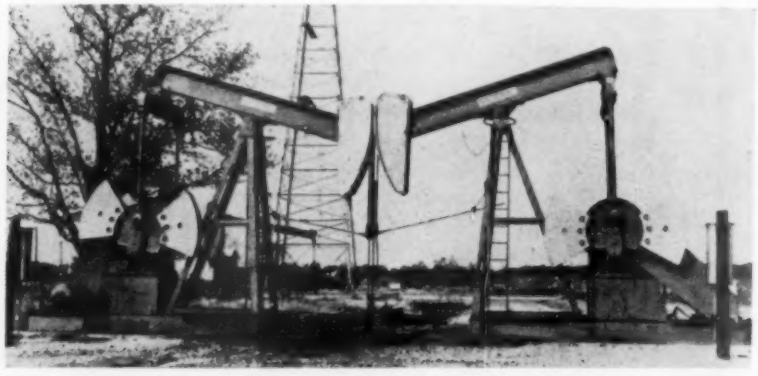
Thus, oil accumulations contained in the reservoir model show up on exposed X-ray plates as dark spots, while the remainder of the plate remains relatively light, the researchers point out.

In "photographing" progressive stages of fluid displacement, X-ray plates are exposed by direct contact with the reservoir model. Exposure times vary, but the average is about three hours. At the end of each exposure period, total fluid displacement is compared mathematically with ionization activity observed on the plates.

On completion of each progressive step in the displacement process, a plate is exposed to give a permanent record of reservoir conditions.

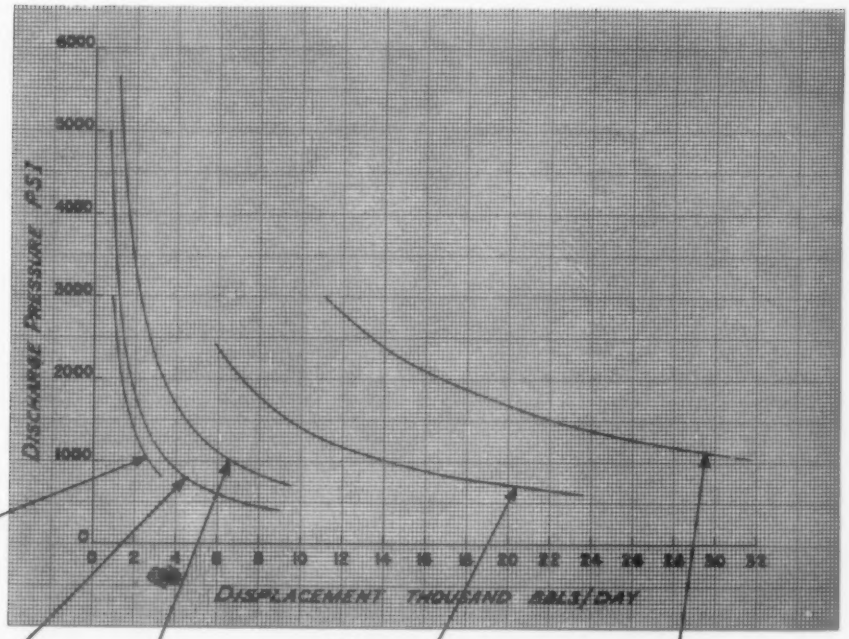
In the study conducted to date, a total of 14 runs have been made—each representing a different reservoir condition. Four exposures were made during each run one at the beginning and end of both the oil injection and waterflood phases.

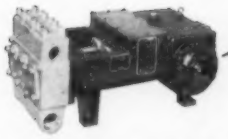
The observation cell was saturated with brine (30,000 parts per million)



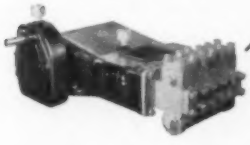
Two Pumps Operate in 5½-in. Casing

J. C. Cullinan is operating these two pumping units in a well cased with 5½-in. casing at Humble, Tex. Use of two strings of 2 1/16-in. tubing made the smaller casing size possible. Specially designed equipment includes two carrier bar and bridle assemblies and two special stuffing boxes for the small tubing strings. Equipment was designed by Huber Corp. and Johnson Fagg Corp., both of Houston, for National Supply Division, Armco Steel Corp., which also supplied the tubing. Pump units are National Type E-18 with electric drive and 64-in. stroke.

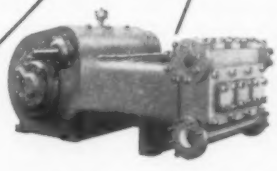




3" Triplex From 820 to 3,279 bpd at 3,000 to 815 psi with 51 hp



4" Triplex From 708 to 8,970 bpd at 5,000 to 400 psi with 66.8 hp



6" Triplex From 525 to 9,480 bpd at 5,650 to 705 psi with 125 hp

8" Triplex From 5,890 to 23,600 bpd at 2,410 to 600 psi with 266 hp

8" Quintuplex From 11,080 to 31,725 bpd at 3,000 to 1,050 psi with 630 hp

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to simulate a typical water-wet reservoir. This was then displaced with a low viscosity, refined oil about the consistency of kerosine until all available pore space was filled with oil, water, or a combination of the two.

The first plate exposure, made immediately following displacement of the initial water phase by the oil phase, is almost uniformly black—indicating that some amount of oil is present in virtually every pore. Analysis has shown that approximately 88% of the available pore spaces filled with oil at reservoir equilibrium. The remainder of the pore space then contains interstitial water and probably minute quantities of air, the researchers say.

An important facet of the project has been an evaluation of the effectiveness of flooding at various stages of reservoir depletion.

This has been accomplished by the introduction of varying quantities of dry gas into the oil-filled reservoir, thus simulating conditions that would exist on the depletion of a normal solution gas-drive reservoir.

Six different depletion stages have been evaluated by varying gas injection from zero to 30% of reservoir saturation preceding stimulation by waterflooding.

"On the basis of preliminary calculations," the researchers report, "it would appear that waterfloods instigated following partial depletion of a solution gas-drive reservoir by primary production are more effective than those initiated immediately following field development."

"However," they caution, "our studies have not attempted to take into consideration such factors as shrinkage due to the release of reservoir pressure, such as would be the case in a high pressure reservoir. Therefore, we have as yet reached no final conclusion as to the proper time to commence waterflood operations."

Two measurements are correlated to determine the relative effectiveness of flooding at various stages of reservoir depletion.

First, relative sweep efficiencies are indicated by the size and number of dark areas appearing on exposed X-ray plates after each progressive flood phase has been completed.

This is true, of course, because the dark areas on the exposed plates are graphic representations of the amount of "passed over" oil remaining in the observation cells. Thus, the plate that exhibits the fewest number of dark areas is indicative of the most effective flooding procedure.

Secondly, coincident with fluid displacement from the reservoir, a Geiger-counter reading is taken of the producer fluid stream. A curve plotted on the basis of these readings gives an accurate representation of the rate at which oil is being removed from the reservoir, and also indicates the point at which coning or breakthrough occurs.

The radioactivity count serves also to indicate the point at which reservoir flow equilibrium is reached, since it is at this point that the count reaches and maintains a static value. This factor is particularly valuable in determining reservoir saturation during displacement of interstitial water by the oil phase.

Other plans for expanding the study are under way. Including is a plan to replace the Geiger counter with a scintillation counter, and the addition of an automatic lineal recording device.

Use of the scintillation counter will give added accuracy and make possible the elimination of lead shielding now required with the counter.

The recorder will obviate the necessity of having an observer in constant attendance, and round out the radioactivity curve, which will make interpretation easier.

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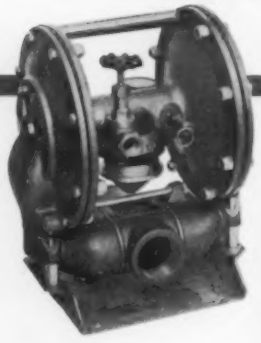

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What's New / IN PRODUCTION

Sinclair Starts Pilot Fireflood in Oklahoma

Sinclair Oil & Gas Co. has started a pilot thermal recovery project in the Delaware-Childers area northeast of Nowata, Okla., to test the economics of fireflooding in reservoirs already subjected to normal recovery methods.

The project is in an area that already had undergone four stages of development: flowing production, artificial lift, repressuring, and waterflooding. These methods have resulted in recovery of only half the oil originally in place.

•

Alberta Studies Leasing Of Lake Bottoms

A group of Alberta's provincial government health and conservation officials will report soon to the cabinet on the feasibility of developing oil and gas reserves under Alberta's lakes.

The group has taken a first-hand look at Louisiana offshore development, in its effort to learn about problems of offshore drilling. Primary consideration is being given to the problem of avoiding water pollution, disturbance of fish and wildlife, and desecration of recreational areas.

There have been occasional cases in Alberta where holes started on shore have been brought in underneath adjacent lakes, but no platform drilling has yet been attempted on lakes.

•

Oil and gas exploration rights to lake beds owned by the state of Montana were sold for the first time Feb. 7. The six lakes involved are all in Sheridan County, in the northeast corner of the state. The 43,747 acres sold netted $109,263, at an average of $2.50 per acre. Highest bid, $31.25 per acre for one lake bed, was by Hunt Oil Co.

•

Three Cleveland County tracts drew highest bids at this week's sale of oil and gas leases on allotted Indian lands at Shawnee, Okla.

Clifton Gall, Oklahoma City, bid $11,184 for a tract in Falls field; Pure Oil Co. bid $8,800 for a tract 4 mi. southeast of Stella; and Anderson-Prichard Oil Corp. bid $1,382 for a tract 2 mi. west of the Roulette Creek sector.

Of the total 176 tracts offered, 16 units, covering 1,569 acres, were sold for $26,552, or slightly more than $169 an acre.

•

Oil and gas drilling reservations covering a total of 170,641 acres in southern, central, and northern Alberta will be offered Mar. 2 by the province. Also, oil and gas rights in areas covering more than 515,108 acres in northern Alberta, will be offered Feb. 21.

•

Nebraska Natural Gas Co., Hastings, has purchased 50% of the stock of Dunne-Gardner Drilling Co., Inc., Wichita, Kan. Dunne-Gardner will continue in the drilling and producing business in Kansas and North Texas, where it recently acquired extensive holdings. Jack D. Dunne, president of Dunne-Gardner, said no changes of operational plans or personnel will result from the transaction.

•

Continental Oil Co. has named Seismograph Service Corp., Tulsa, as licensee for its "Vibroseis" exploration service.

L. F. McCollum, president of Conoco, said, "In this system, vibrators on the surface of the earth are used to generate seismic waves, instead of utilizing buried explosive charges of dropping weights as is presently done" (PW—Apr.11'58,p55).

•

Placid Oil Co. expects to recover an additional 3,267,082 bbl. of oil by waterflooding the Franks (8,900-ft.) pool, Galveston County, Tex.

The company, as designated unit operator, has asked the Texas Railroad Commission for approval of its unitization program.

•

Roderick A. Stamey, Houston independent, has received preliminary approval to search for oil on North Carolina wildlife lands in Pender and

Duplin Counties. Stamey had previously received approval of an agreement under which he plans to drill on state-owned land located in the eastern part of the state.

•

A revised, color-coded map of Ohio's oil and gas fields has been prepared by the state's Division of Geological Survey.

The revision of the 1953 map also shows underground storage areas and has a table listing names of all fields and related information.

•

Hunt Oil Co. will start construction in late spring on a plant to process gas from over 100 oil wells in North Tioga and McGregor pools, Divide and Williams Counties, N. D.

The $2-million installation, to be built near the town of McGregor, will have a capacity of 10-million cf/d of gas, and will turn out 32,000 gal. of liquids daily, plus eight long tons of sulfur.

Hunt will operate the plant for participants in the North Tioga (Madison) unit, involving approximately 50 working interests.

Engineering

A lease automatic custody transfer unit that requires only four connections for operation has been developed by National Tank Co., Tulsa.

The positive-displacement unit is connected at the inlet line, pipeline delivery line, rejected oil line, and electric power input.

Varied lease producing characteristics may be accommodated from one standard unit, the company says, by using in-stock accessories to meet specific requirments.

•

Drilling Highlights

North Dakota—Hunt Oil Co. No. 1 Price, section 29-159n-103w, Williams County, recovered 470 ft. of oil, 36 ft. of mud, 94 ft. of highly gas-cut oil and mud emulsion, 94 ft. of slightly mud-cut oil, and 94 ft. of salt water on 5-hour drillstem test of the Madison at 7,718-36 ft. The wildcat is 5 mi. northeast of Madison production in the Dwyer area of Montana's Sheridan County.

Southwest Texas—Sunray Mid-Continent Oil Co.'s quintuple producer, No. 21-E J. A. McFaddin, Foster Lewers survey, A-255, Victoria County, flowed 600,000 cf/d of gas through perforations at 5,138-43 ft; 4 b/d of oil through perforations at 5,277-80 ft.; 625,000 cf/d of gas and 5 b/d of oil through perforations at 5,530-34 ft; 20 b/d of oil through perforations at 5,640-44 ft., and 125 b/d of oil through perforations at 6,360-64 ft. The quintuple, first on land and only the second in the industry, is in McFaddin field.

New Mexico—Honolulu Oil Corp. No. 1 McKittrick Canyon Unit, section 25-22s-25e, Eddy County, flowed gas at the rate of 8.5-million cf/d through ¾-in. choke and perforations at 11,193-257 ft. in the Morrow. Recovery during the 2-hour test was 240 ft. of gas mud and condensate-cut blanket, and 20 ft. of condensate. The Pennsylvanian wet-gas prospect is 6 mi. northwest of Delaware production in Dark Canyon pool.

Oklahoma—Mid-American Minerals, Inc., No. 1 Tretbar, section 27-4n-23e, Beaver County, was completed for 13-million cf/d of gas on open flow and perforations at 6,947-87 ft. in the lower Morrow. The discovery is 2 mi. northeast of Six Mile field.

West Texas—Texaco Inc. No. 1 R. M. Means, section 21, block 3, public school land survey, Andrews County, was completed for 229 b/d of 43.3-gravity oil through ½-in. choke and perforations at 10,612-25 ft. in the Strawn. The strike is 4 mi. northeast of Wemac pool.

Also in Andrews County, Santiago Oil & Gas Co. No. 1-14 University, section 14, block 11, University Lands survey, was completed as Fusselman discovery flowing 210 b/d of 41-gravity oil through 15/64-in. choke and perforations at 7,950-60 ft. The well is ¾ mi. east of Block 11 Ellenburger pool.

California—Honolulu Oil Corp. No. 1 Balsdon Unit, section 34-14n-1w, Colusa County, flowed 2,240,000 cf/d of gas through 15/64-in. choke and perforations at 9,576-96 ft. in the F sand (Cretaceous). The gas production is the deepest in the Sacramento Valley. This discovery is 4 mi. northwest of Buckeye field.

British Columbia—Western Natural Gas Co. et al No. 2-B-30-F Kathy, B-30-F-94-P-3, in the northeast corner of the province, was completed as a middle Devonian discovery flowing at the rate of 9,089,000 cf/d of gas through ½-in. choke. The well is 5 mi. northwest of production at North Kotcho.

Sunflower Husks Stop Mud-Loss

The common Helianthus Annuus—the sunflower, of course—has been plucked and pressed into double "oil duty" in Canada. The husks shed from sunflower seeds in vegetable oil processing have been found highly effective as a mud-loss inhibitor during oil drilling.

Western Canadian Seed Processors, Ltd., Lethbridge, Alberta, recently put into operation a $3.5-million vegetable-oil plant, which can derive up to 66 tons of sunflower husks from 200 tons of seed each day.

The company had considered marketing this residue as a fuel, since it has a high Btu. value.

But evidence of the husks' success as a bridging and plugging agent led Western Canadian to market the product at a price it says is competitive with sawdust and shavings, which account for nearly 80% of the volume of lost-circulation materials now used by Canadian drillers.

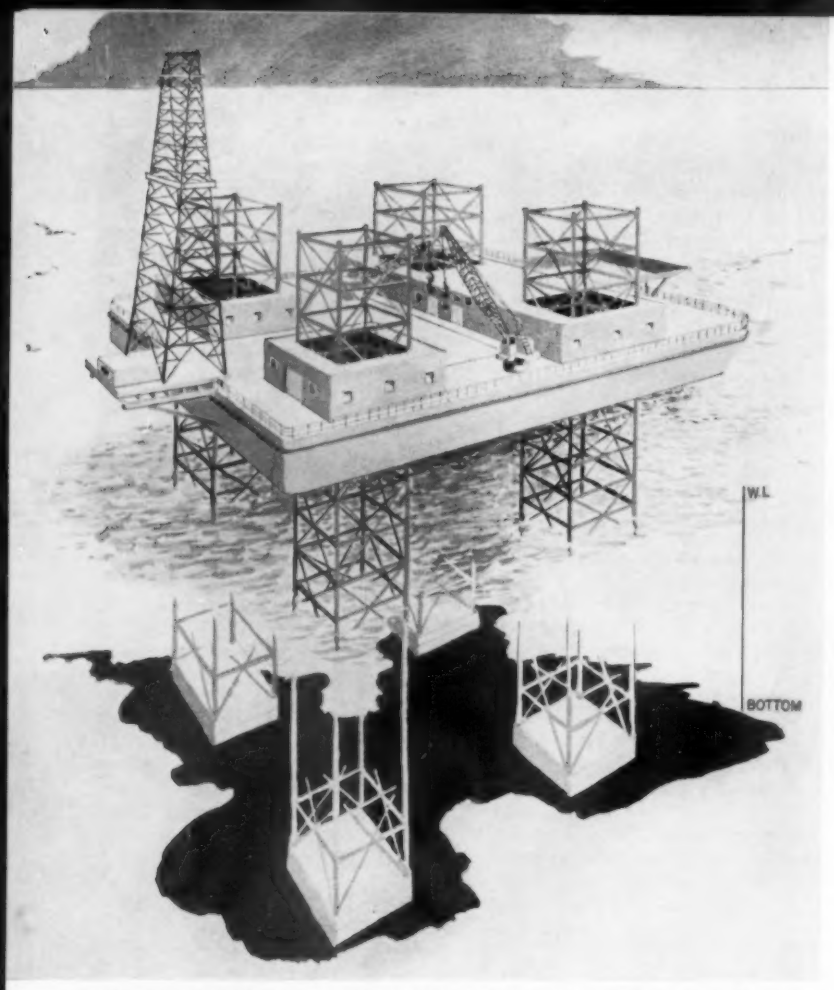
Western Canadian's general manager, W. G. Clarke, appraised this novel use of husks by saying, "As far as we know, it's a real first."

A. A. King, manufacturer's representative for Western Canadian Seed Processors, Ltd., explains that the husk particles interlock to provide a positive sealing action, whether circulation loss is due to fissures, cracks, or porous strata.

A representative of a company that has tried the husks in its mud work says that the feels the material is going to prove ". . . one of the best" available.

Western Canadian has dubbed its product Husk-y Seal, and is packaging it on 30-lb. plastic bags. Several Canadian mud companies are now buying and using the husks, and Jersey Production Research Co. has been running further tests on Husk-y Seal in Tulsa.

Since sunflowers abound in Manitoba, and run riot in Argentina, the supply is abundant—and cheap. Clarke also points out, "It helps the farmer, too. We couldn't pay as much for the seeds if we couldn't use the husks."



OFFSHORE UNITS OF THE FUTURE? Self-elevating type (left) could operate in waters 200 ft. deep; the fixed-height-deck type

Optimism Is the Keynote as Offshore

All the indicators point to a real expansion in offshore activity this year, with the focus again on submerged lands off Louisiana. Construction yards reflect the tempo, and designers are busy on units for deeper waters.

The pulse of offshore oil development today is strong and steady. This vast oil province—fulfilling its earlier promise of stabilization—has entered 1961 looking very good indeed, compared with many other domestic areas.

The offshore region rebounded last year from the cyclical downturn that hit the entire industry. Individually, the companies most closely associated with offshore operations reflect widely differing management attitudes toward 1961 plans, ranging from "less than anticipated expenditures" to "about the same" to "about double the 1960 rate."

In the aggregate, however, the forecasts add up to a real, if not boomlike, expansion in operations this year, along the lines of the prediction by the president of one major company for "a continuing, steady development."

The signs and indications are plain and tangible on the scene itself: more activity in fabricating yards; busy drilling equipment, particularly mobiles; designers busy on plans for new equipment; upward-trending lines on statistical charts, and more.

Nowhere is the tone of optimism, the sense of a quickening beat, more apparent than in the shipyards and fabricating yards seeking offshore business. The yards are bidding on a variety of proposed structures and equipment.

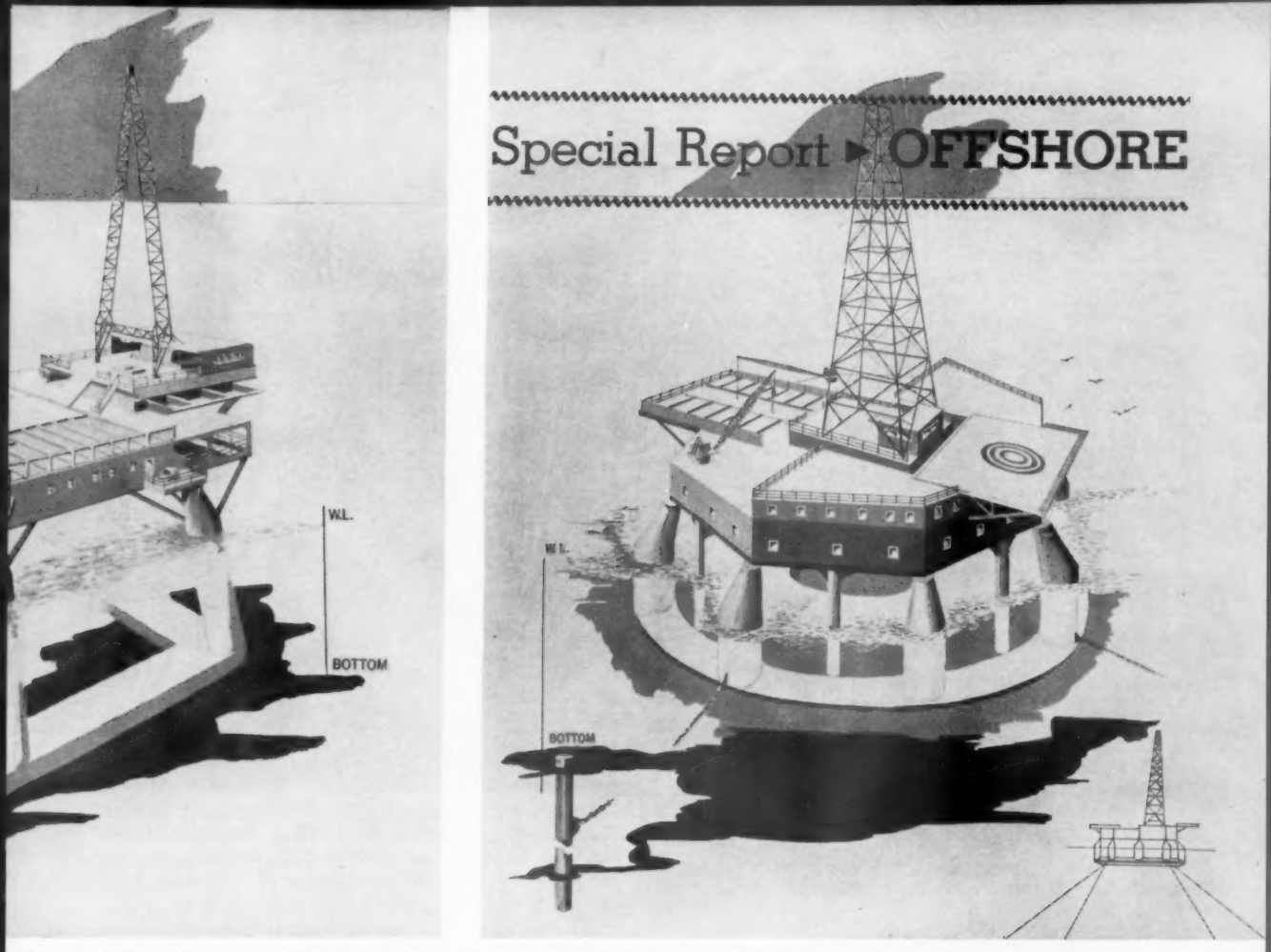
For the most part, the activity right now still is only in the bidding stage.

Representatives of the bulk of the yards involved, however, say they are "very optimistic" and are encountering an "encouraging amount of interest" in new offshore equipment.

"We're bidding like mad," says the head of engineering for one Gulf Coast marine engineering and construction firm. "So is everybody else. It looks very good."

Actual yard activity, compared to a year or so back, also has picked up noticeably.

The results already are showing up in "hardware." At least one yard has had to expand its working area, largely



(center) is for 100-ft. water depths; the variation of the fixed-height-deck type (right) is designed for use in very deep waters.

Activity Pushes Steadily Upward

because of the influx of offshore equipment construction contracts.

J. Ray McDermott, Inc., has put in an entire new shipyard facility within the past year at its sprawling Bayou Boeuf installation, near Morgan City, La., to handle, among other things, the big increase in offshore equipment work.

The firm is just completing a three-legged, self-elevating mobile—the Offshore No. 58—for Offshore Co., Baton Rouge. The unit, designed for operations in water to 60 ft. deep, is scheduled for service abroad, initially.

McDermott has just built and installed in 183 ft. of water for Gulf Oil Corp. one of the largest self-contained platforms ever put in service in the Gulf of Mexico. The eight heavy-wall pipe legs are 205½ ft. long and 33 in. in diameter. The template-type structure measures 40x115 ft. at the top, and 82x156 ft. at the bottom. The deck section, weighing 225 tons, measures 40x145 ft. It is anchored by 30-in. steel pilings driven through each of its eight legs into the Gulf bottom.

Under construction is a 57x110-ft. (deck size), 24-well platform, with a seven-pile anchor system, for Texaco Inc. It will operate in 105 ft. of water in South Pass Block 37. Because of extremely soft bottom conditions, this platform is being equipped with skirt piles. And its 155-ft.-long leg piles are designed to be shoved some 30 ft. into the mud. The platform will be used for tender operations initially, then be converted into a self-contained platform.

In addition, McDermott has work under way on four other platforms (one for Superior Oil Co. and three for The California Co.), as well as many wellhead protection platforms, gathering facilities, and caissons.

Activity is picking up in other yards, too.

American Marine Corp. is building an elevated deck-type barge designed for 18-ft. water operations for Sea Drill Corp., and has other work under way or projected.

Levingston Shipbuilding Co. reports that it has bid on several offshore equipment jobs, and notes that 100-ft. depth-range units are being considered by the industry.

Higgins, Inc., is working on piers and personnel bridges currently, and has bid on a considerable array of platforms, jackets, and other items.

R. G. LeTourneau, Inc., expects to begin construction within the near future on "several" drilling units for shallower-depth waters, and possibly also on one of its giant, slanted-tri-leg units for drilling in water depths exceeding 150 ft.

Bethlehem Steel Co.'s Shipbuilding Division has made preliminary proposals on various units, and reports that

continued ▶

industry plans apparently call for "possibly two or three offshore units during 1961," with indications that some are scheduled for 100-ft. water-depth operation. There also may be a unit scheduled for operation in 225 ft. of water.

Bethlehem is just finishing The California Co.'s second mobile submerged storage unit, and says it has encountered interest from other operators in this type of unit.

Brown & Root, Inc., is constructing platform and production equipment for use in waters to 200 ft. deep for several operators, including Shell Oil Co., The California Co., Mobil Oil Co., Gulf, and the CATC group.

The fabricators evidently are determined to make the most of whatever offshore opportunities come along. They are showing signs of being willing to tackle almost anything, provided the incentive is there—even an order for a floating drilling unit.

The yard superintendent for one of the large construction companies, which has picked up a substantial number of jobs, says:

"Our business has increased because we made up our minds to go after it. The idea is to diversify, but with the point in mind of keeping all our equipment busy. No place is too far, too tough, or too dangerous for us, providing the financial incentive is there."

Several firms report that they are "hearing talk" among operators about floating drilling units, although none says anything concrete is in the works.

The tipoff, of course, was last year's offshore lease sales, when the industry laid some $290-million in bonuses on the line.

Federal tracts off Louisiana drew most of the bid money, but the U.S. leases off Texas didn't do badly. And both Texas and Louisiana got a share of the bonuses for various state leases.

Since, on balance, the offshore hasn't paid out during the ten-odd years the industry has been tackling it seriously (Shell Oil Co.'s John Pittman estimated last fall that some $2-billion to $2.5-billion are still unrecovered), the question is, why such a huge investment?

A simple answer is hard to come by. Actually, a combination of factors is involved.

Much of the huge offshore investment is a down-the-road proposition predicated on the premise that reserves must be found now for future needs, despite the high prices.

The uncertainty over the future of some foreign concessions may be turning management thinking more strongly to domestic possibilities.

And, acre for acre, the offshore evidently "offers more prospects in large blocks than can be found on land—even if it is more expensive to get it," as one company official sees it.

Off Texas and Florida, the going still is slow and relatively unrewarding. Operators indicate it will stay pretty much that way this year.

There are 156 active oil and gas leases off the Texas coast, totaling 347,090 acres. Of these, 95, totaling 87,890 acres, are state-controlled, and 61, comprising 259,200 acres, are U.S.-controlled.

Of the state leases, 34 are productive, covering 32,158 acres, and 13 of the federal tracts, including 23,040 acres, are productive.

Production is running at the rate of 1,638 b/d of crude and condensate, and 41,628,000 cf/d of casinghead and natural gas.

MOBILE PRODUCTION BARGE, The California Co.'s S-93, is shown being towed to location offshore Louisiana. The tubular legs and tank base can hold 20,000 bbl. of crude. The unit is set 10 ft. below the ocean floor in 25 ft. of water.

Not much activity appears to be in the cards for offshore Texas in 1961. Operators holding leases indicate that there will be fewer than a half dozen holes—wildcat or development—drilled this year.

Currently, Pan American Petroleum Corp. is drilling a 13,000-ft. test on Galveston Block 389, and Shell is drilling a 13,000-ft. attempt on High Island Block 236, in a joint venture with Mobil.

Shell also is planning a 12,500-ft. venture on Galveston Block 293, and Standard Oil Co. of Texas is contemplating an 11,000-ft. test off Galveston.

Should one of these wildcats turn up something really significant, all bets would be off. Otherwise, the waters off Texas won't see much activity during 1961.

On the surface, this attitude is contradictory to the fact that the industry plunked down $35.7-million for 240,480 acres in the federal lease sale off Texas last February, and almost $2.3-million more for 21,962 acres offered by the state last December.

Operators evidently are planning to move slowly, having experienced disappointment, predominantly, in exploratory drilling in the area.

The 23 leases, totaling 132,400 acres, in the Marquesas Area off Florida—acquired in 1959 jointly by The California Co. and Gulf Oil Corp. for a bonus of $885,139—have failed, so far, to yield production.

A 15,294-ft. test, Gulf-Calco No. 1 OCS, was plugged and abandoned in April, 1960.

Calco recently has been core drilling, using a floating

continued ▸

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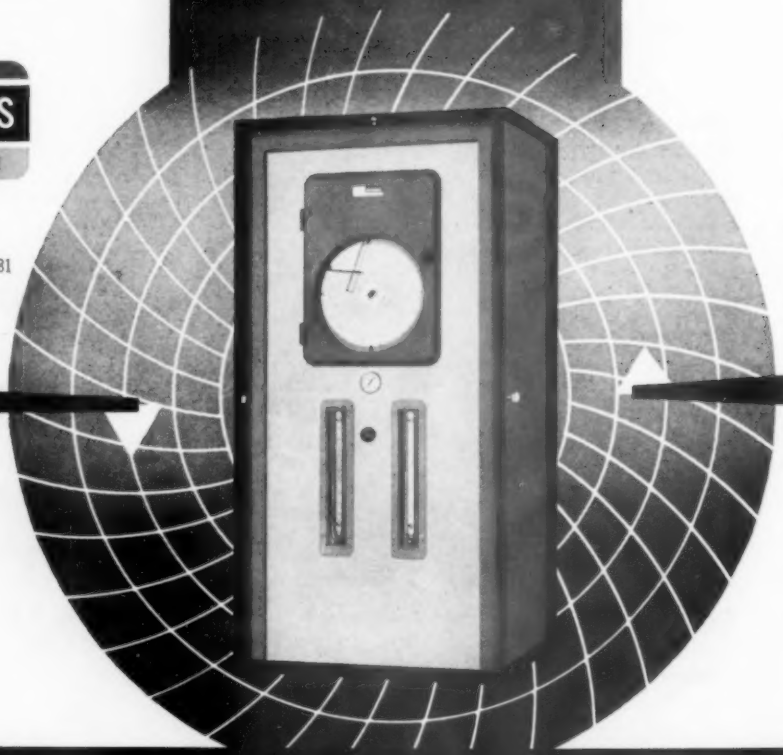


vessel, on the OCS-44 tract for the joint account. Additional core drilling is planned for 1961.

The decision by the California State Lands Commission to offer offshore tracts at a one-a-month clip this year could step up activity significantly on the West Coast, despite lack of any bids for the first parcel offered.

F. J. Hortig, executive officer of the commission, said lack of interest in Parcel 1—a 4,250-acre tract off Santa Barbara County that was offered Feb. 3 (PW—Feb.10'60, p15)—may have been due to proximity of the lease to the Pacific missile range and also to shipping lanes, which might make development difficult. The parcel was the first offshore lease offered by the state since July, 1958.

The next offering, Parcel 2, will be on Mar. 3. The parcel was nominated by Shell Oil Co. Another offering, Parcel 3, will be on Apr. 7. The two 4,250-acre parcels are also off Santa Barbara County.

Hortig says that clearance has been obtained from Santa Barbara County that could permit the leasing of another eight or nine parcels of around the same size between Point Conception and the western end of the Elwood oil field.

Hortig says there also is a possibility of offerings in the Montalvo area, off Ventura County.

The last group of leases offered, in 1958, yielded a total of more than $55-million in bonuses for five 3,840-acre tracts. Obviously, if the one-tract-a-month schedule pans out, the total bonus figure this year could easily top that.

The sharply plunging water depths off the West Coast, along with other technical difficulties, have dictated a much slower rate of progress there than off Louisiana.

Drilling procedure off the West Coast differs substantially in some respects from that off Louisiana, Texas, or Florida. The usual program calls for wildcat drilling from floating vessels. Once a structure is defined and production assured, development drilling is carried on from platforms or islands.

A respectable, though not spectacular, increase in activity off California is indicated for existing leases this year. There is almost certain to be some wildcatting this year, for example, on the first two parcels to be offered. And there is a good possibility of additional wildcatting on at least some of the tracts scheduled for leasing during the next few months.

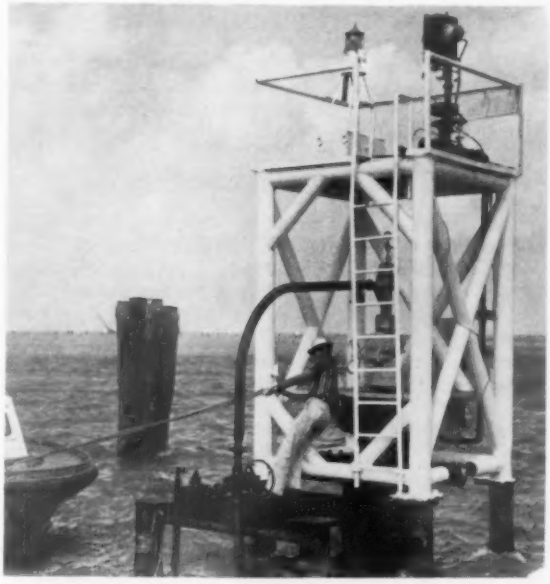
Just how much, of course, is anybody's guess.

Shell Oil Co. announced only a few months ago that it will drill its first hole in the Pacific—No. 1 Refugio State—as a farmout on the south half (1,920 acres) of Standard Oil Co. of California's Parcel B, off Santa Barbara County. The 10,000-ft. test will be drilled from the CUSS 1 drilling vessel operated by Global Marine Exploration Co., contractor for the Shell test.

During 1960, there were 13 wildcats (including stratigraphic tests) and 46 development wells put down off California, with a few of the development wells on the older leases being slant-drilled from shore. Some of the development wells are listed in the "suspended" category —usually cased but uncompleted, for one reason or another.

Unannounced but probable drilling plans for 1961 point to a minimum of 53 development wells—7 more than last year.

The wildcatting programs depend almost entirely on the leasing program and the outcome of holes currently being drilled.



THE DISCOVERY for offshore's biggest oilfield, South Pass Block 24, was this 1950 well, Shell's No. 1 State lease 1008.

One of the last leases sold by California—Parcel E, off Santa Barbara County—is nearing the development stage, pointing up the current status of West Coast submerged lands.

Also known as Cojo-Offshore, the 3,840-acre lease was awarded to Phillips Petroleum Co., Pauley, Kerr-McGee Industries, Inc., et al in 1958 for a cash bonus of $5.1-million. This tract adjoins the newly offered Parcel 1 tract.

Phillips, as operator, has drilled 11 stratigraphic tests on the block, and will commence development drilling shortly in some 100 ft. of water with a platform designed to accommodate 33 wells.

By the end of 1960, there were 104 wells off the California coast—98 oil, 4 gas, and 1 suspended. Of these, 36 oil wells are at Monterey Oil Co.'s Belmont-Offshore Island (Orange County); 46 oil wells at Richfield's Rincon Island (Ventura County); 16 oil wells on Standard Oil Co. of California's two Summerland-Offshore platforms (Santa Barbara County); 2 gas wells slant-drilled on Phillips' Parcel A; 2 gas wells slant-drilled on Stancal-Humble Oil & Refining Co.'s Parcel C; and 1 suspended well on Texaco Inc.'s Parcel D platform. The latter 5 wells are all off Santa Barbara County.

Production currently is averaging around 9,000 b/d of crude and around 13,850,000 cf/d of gas—small compared with the output off Louisiana, but a considerable increase over the 5,553 b/d of crude and 3.7-million cf/d of gas averaged during 1959.

The five tracts leased by California in 1958 have yielded three discoveries—gas-condensate on Parcel A, by Phillips; gas on Parcel E, by Phillips; and one oil (and one probable) on Parcel D, by Texaco.

continued ▸

Offshore Louisiana Leads

Offshore Louisiana, however, continues to be the top region. A look at the lease situation points up the somewhat surprising advance in that area's lead margin.

In its sale a year ago, the federal government received bonuses totaling $246.9-million for 99 Outer Continental Shelf leases totaling a little over 464,000 acres off Louisiana.

Of these tracts, 11 brought between $1-million and $2-million each; 6 between $2-million and $3-million; 11 between $3-million and $5-million; 9 between $5-million and $7-million; and 13 blocks that commanded more than $7-million each, with 4 of these carrying a price tag in excess of $10-million.

Furthermore, many of the tracts are in very deep water, in excess of 100 ft., and some are a considerable distance from shore.

Placed against the background of a generally lackluster domestic scene, the sale stood out vividly and, as predicted, pointed unerringly to the strong surge of activity that followed it.

The significant fact is that development of Louisiana's offshore rose steadily last year, topping the previous two years by a good margin. It was, in fact, exceeded only by the boom year of 1957.

According to preliminary tabulations by the Louisiana Dept. of Conservation, there were 652 holes drilled off the coast during 1960—429 oil wells, 97 gas wells, and 126 dry holes.

This is 96 more than 1959's 556-hole total (395 oil, 65 gas, 96 dry)—a 17% increase—and 39 above 1958's 613 (393 oil, 109 gas, 111 dry).

Last year's total was exceeded only by the 716 holes (470 oil, 97 gas, and 149 dry) drilled in the peak year of 1957. It was in the latter part of 1957 that the bottom dropped out of the offshore effort, temporarily, resulting in the activity decline of 1958 and 1959.

There were four offshore discoveries during the year —one oil and three gas.

Gulf made two gas discoveries, on South Marsh Island Block 23 and on Ship Shoal Block 169. Superior Oil Co. made the other gas discovery, on Vermilion Block 102. Shell made the oil discovery on Eugene Island Block 100.

The upward trend offshore was counter to that of Louisiana's onshore activity, which decreased.

During 1960, for example, Louisiana as a whole recorded the completion of 2,441 producers. This was a 29-well decrease from the 1959 figure of 2,470.

Yet there was a 66-well increase for offshore producers—526 in 1960, compared with 460 in 1959. Again, the only year to top the 1960 offshore rate was 1957, with 567 producers.

On another tack, the state issued 4,796 drilling permits during 1960, an increase of 176 over the 4,620 issued in 1959. Offshore drilling received 786 of these permits—105 more than the 681 granted in 1959. So the offshore accounted for 105 of the over-all increase of 176.

The record demonstrates the remarkable turn-about from the two-year trough.

Louisiana's offshore crude production rose more than 20%, far outstrippng, percentagewise, the onshore rate of increase.

WELL JACKET is placed on location in 70 ft. of water in South Pass Block 27 field. Drilling begins after placement.

MOVABLE OFFSHORE NO. 2, submersible drilling platform, on location for Shell Oil Co. in South Pass Block 27 field.

The Louisiana Dept. of Conservation's preliminary tabulations bear out the swiftly expanding nature of petroleum activity off the state's coast (table, page 50).

Last year, 83,836,612 bbl. of crude were produced from the submerged lands off Louisiana—a hefty 20.3% increase (14,142,997 bbl.) over 1959.

Big hikes also were posted in production of condensate, casinghead gas, and natural gas.

There were 4,163,339 bbl. of condensate produced offshore—1,064,175 bbl., or 34.4%, more than in 1959.

Production of casinghead gas rose to 88,947,099,000 cu. ft.—slightly above 21-billion cu. ft., or 30.9%, more than in the previous year.

Output of natural gas climbed to 318,696,820,000 cu. ft.—57,359,309,000 cu. ft., or 21.95%, greater than in 1959.

continued ▸

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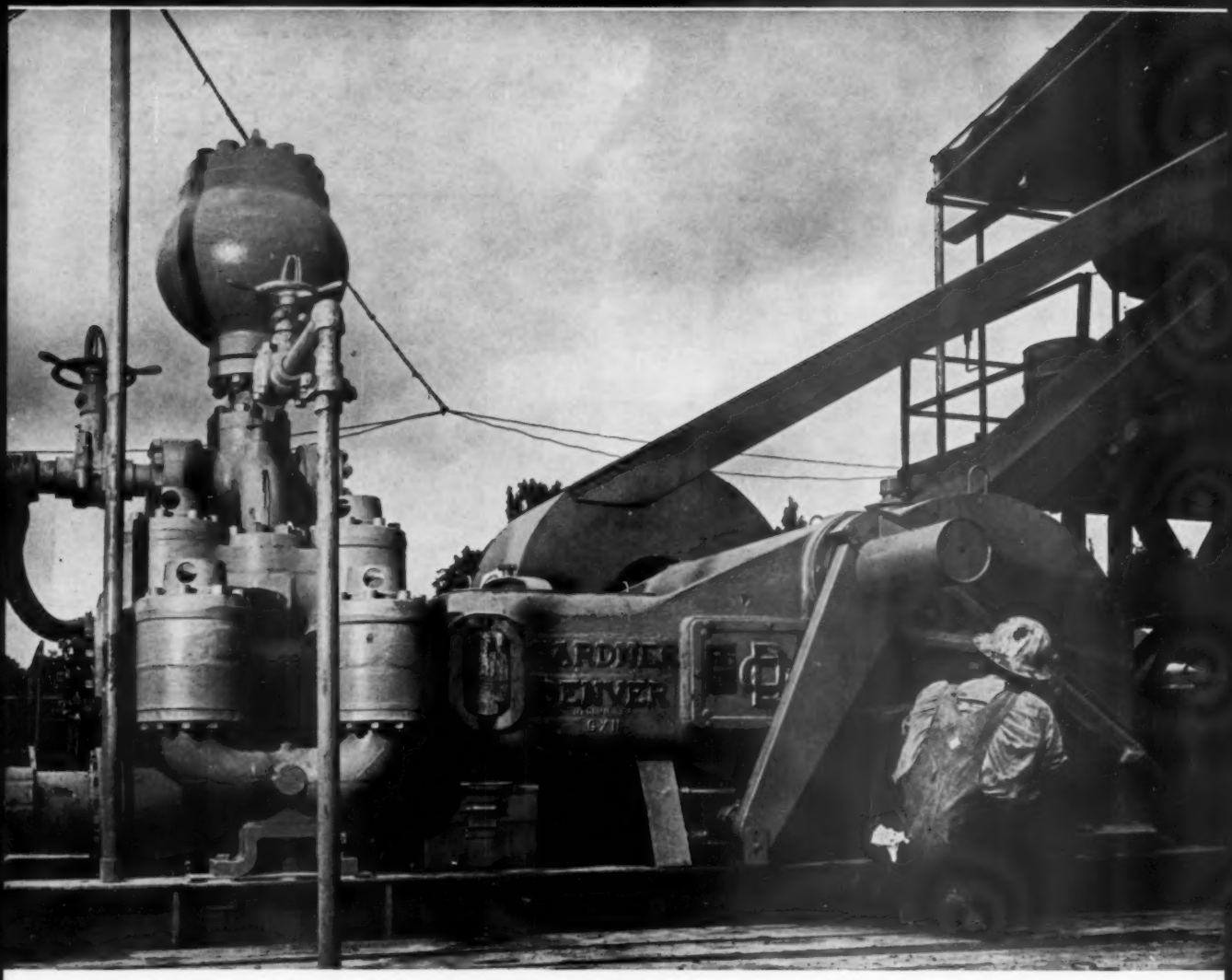

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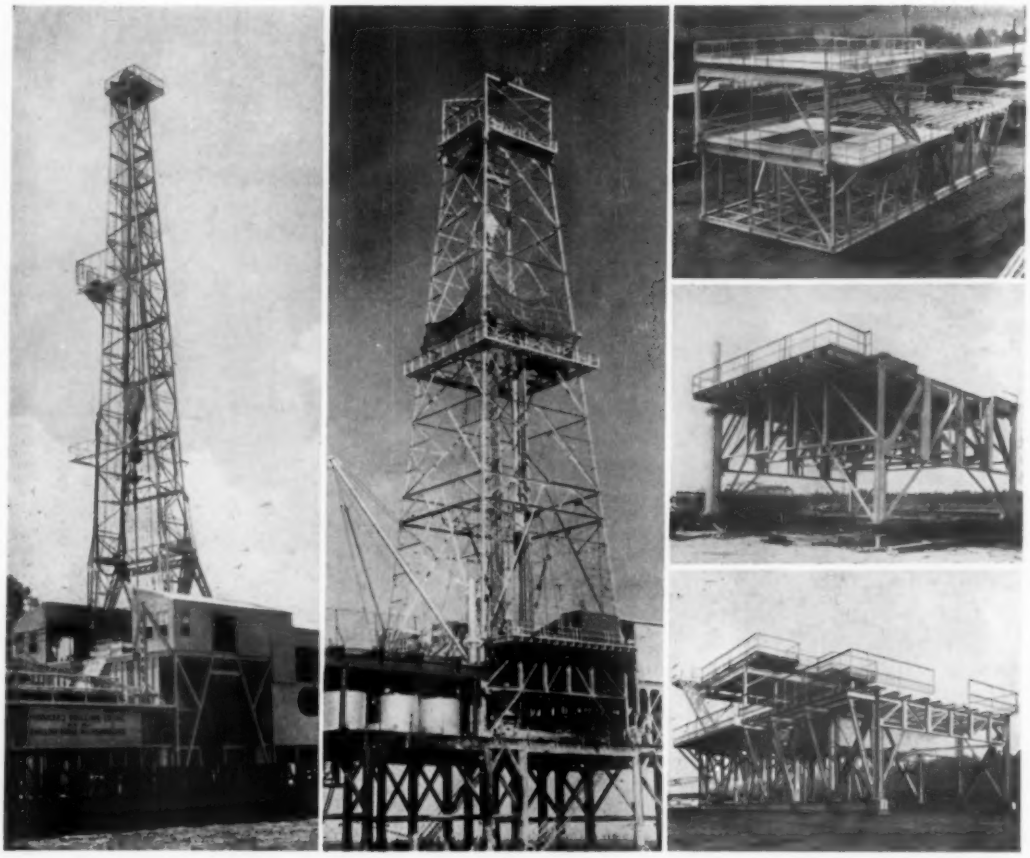

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OFFSHORE PIPELINE web is growing. Here a 20-in. gathering line is laid in South Pass Block 27 field off Louisiana.

If the present trend continues, the surge could carry offshore Louisiana activity to record heights this year, despite various new problems the operators will face.

If the projected programs for 1961 are followed, there could be something in the neighborhood of a 20% increase in activity. The indications are for a boost of more than 20% in development drilling, and a nominal increase of 1% in wildcatting.

If these plans mature on schedule, it could mean the drilling of some 780-785 holes during the year. This would top the 1957 high of 716 holes substantially.

Even half of that rate of increase—10%—would place 1961 activity on a par with that of 1957.

Outside economic influences, of course, brought on the 1957-58 ebb, and it could happen again. And offshore operators will be up against all of the old problems, and some new problems, this year.

Some reasons for the optimistic outlook: (1) the aggressiveness with which operators moved in to lease the offered federal tracts, and (2) the speed with which they have moved onto the new tracts and started drilling.

With a five-year period in which to validate OCS leases, the operators generally took their time after previous sales in cranking up exploratory drilling programs.

Not so this time. Drilling equipment began hitting the new leases almost as soon as the ink dried on the acquisition forms.

Illustrative of this development is the fact, for example, that the CATC group probably will have tested all of its new leases by the end of 1961, with the possible exception of one or two.

With the bulk of the new acreage still to be treated, the success ratio off the Louisiana coast has been excellent so far. Score for the year: 24 certain and 11 probable producers.

The 11 probable wells are listed in the "suspended" category, meaning that the wells have been drilled and cased, but not completed for one reason or another. Until the wells are completed, potentialed, and reported, they cannot be carried as producers. If these were added to the successful wildcat list for the newly acquired acreage, the score would be 35.

A total of ten dry holes were drilled on the new leases during the same period. So the success ratio, as of the end of 1960, was 3½ to 1.

In contrast, the results for new leases off Texas were nil for the year. Shell abandoned a 16,091-ft. wildcat—located in some 60 ft. of water—last December on its $5.9-million Galveston Area Block 288 lease. And Continental Oil Co. also wound up with a dry hole on Galveston Area Block 349, for which it paid just over $900,000.

Ahead: Deep-Water Drilling

The leasing and the drilling point up one of the most significant facets of the current offshore effort: The industry is firmly committed to considerable operations in very deep water, now and in the immediate future.

Nearly half of the new acreage lies beyond the 70-ft. water-depth contour, and almost a quarter of it is beyond the 100-ft. depth line.

Of the 464,046 acres leased off Louisiana, only a bit over 44,000 acres lies within the 40-ft. water-depth line, according to authoritative industry analysis.

The bulk of the new acreage—more than 180,000 acres—lies in water between 40 and 70 ft. deep. More than 90,000 acres are in the 70-100-ft. range. Some 58,000 acres are located between the 100-130-ft. lines. And a very surprising amount, more than 80,000 acres, is in waters greater than 130 ft. in depth.

Off Texas, none of the 240,480 acres is within the 40-ft. contour. Some 145,000 acres are in the 40-70-ft. bracket; more than 60,000 acres in the 70-100-ft. strip; and around 27,000 acres fall in the 100-130-ft. category.

Obviously, the average water depth for activity has to increase, and sample questioning of companies operating offshore bears out the conclusion that the trend is well under way.

Based on presently projected development programs, however, the major part of the drilling will still be in waters less than 60 ft. deep.

The biggest part of offshore production found so far lies within this water-depth bracket, and those fields are far from fully developed.

So it obviously will continue to contain the more concentrated activity. In fact, if the need existed for the oil, at least double the number of rigs now involved could be kept busy for a long time in this area.

But there will be a substantial stepup in drilling out to the 100-ft. line, compared with the previous rate, and a noticeable increase in even deeper waters. It is at these depths that the industry faces its most formidable challenges.

Possessing the capability to operate in such depths is one thing. Doing it on a full-scale basis is another.

The industry hasn't licked the cost problem in shallower waters, and the problem gets progressively tougher with depth. The technical problems of drilling and producing also are much greater.

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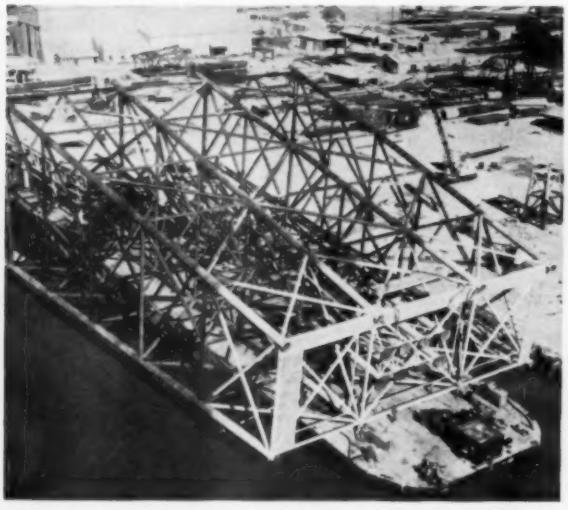
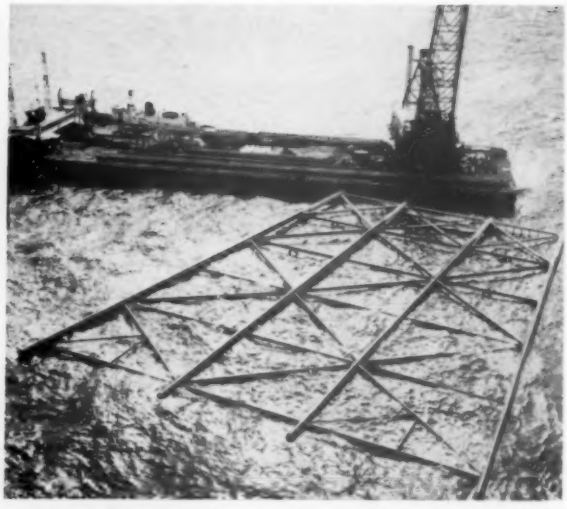


BEING TOWED is Gulf Oil Corp.'s Platform C. The unit was launched by sliding down greased ways installed on the barge.



BEING FLOATED after launching, Platform C, one of the largest template-type units ever built, is ready for positioning.

Technical Advances Help

Some of the needed technical advances already have been achieved. Underwater well completions, in the research stage a year ago, are now an operational fact. Richfield Oil Corp. (L.A.) was first, with its completion off Peru, and Shell Oil Co. followed with the first off the continental U.S. only a few weeks ago (PW—Jan.13'61, p14; Aug.26'60,p35).

These developments underscore the ability of the industry to come up with solutions for the more pressing offshore problems.

Richfield ran into a minor setback when the hole slated for the ocean-bottom completion on its Rincon (Ventura County) lease off California proved dry. The company, however, moved its drilling barge some 750 ft. northeast of the dry hole to try again to effect an underwater completion similar to the one it made off Peru in a joint venture with Peruvian Pacific Petroleum Co., a Cities Service Co. subsidiary.

Richfield says it contemplates only "a couple of small equipment changes" for the proposed completion. One of these reportedly is in the lines tapping the wellhead.

It is reported that the Rincon wellhead will be enclosed in a covered protective steel cylinder rising 12 ft. above the ocean floor, with the top of the cylinder more than 50 ft. beneath the water line at low tide.

The well would produce from the same zones as the 46 wells located some 3,000 ft. away on Rincon Island.

Shell's precedent-setting well—No. 7 OCS 407, West Cameron Block 192 field—was completed in 56 ft. of water. Details are still sketchy, but it is known that the wellhead itself was placed on the sea bottom by remote control from the conventional bottom-supported platform used to drill the well, without aid of divers.

Shell, at last report, was attempting another underwater completion in the same area.

At least one other offshore operator—The California Co.—plans an underwater completion this year, and other companies may follow. Calco's program calls for such a completion in shallow water on a trial basis sometime this year, as a followup to earlier research and experimental field work.

One offshore operating group is considering the possibility, and others are watching developments closely.

One firm active in offshore contract drilling reportedly is working on plans to offer this completion technique to operators on a contract basis.

This development takes the industry to the brink of full-scale operations in very deep waters, but more are needed to carry it across. At this point, the economics of underwater completions are nebulous.

This, naturally, is true of any first-stage development. Many factors enter into such calculations—subsoil conditions, water depth, distance from shore, the method of drilling, and the like.

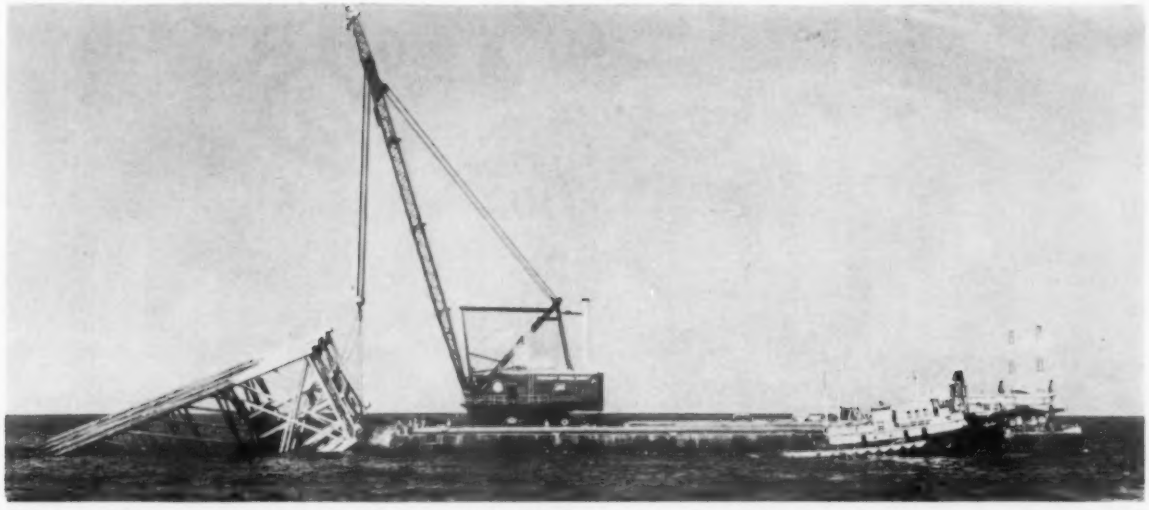
The completion itself evidently isn't the problem any longer. Producing the well is. The researchers and the project engineers now are wrestling with the question of how the well can be produced to depletion.

And there also is the nagging headache of practical storage facilities—almost certainly of the underwater variety—in the really deep waters.

Preliminary studies indicate that all of these can be economic, given necessary favorable conditions, else the operating companies wouldn't be going ahead on the procedure. But the final answers are some time away.

The only feasible storage method for crude in very deep waters seems to be, at this point, some type of underwater facility. A good start already has been made in this direction with two full-scale installations in operation now, and two more on the way.

The California Co. put its 20,000-bbl.-capacity mobile production barge S-93 into service last fall, and will move an identical one on location within the next few weeks. The S-93, built by Bethlehem Steel Co.'s Shipbuilding Division, is handling production from Eugene Island Block 110 field in some 25 ft. of water (PW—Oct.14'60,p57).



BEING RAISED to vertical by the derrick barge, Gulf Oil's Platform C structure will be positioned on site previously selected and marked by a buoy. After piling has been driven through the legs, the deck section will be set in place on top of the structure.

It is handling nine streams from five wells—one single and four duals—with a full-time three-man crew.

Calco reports the facility is functioning "like a charm," with no real problems. The company says it had expected some difficulties in loading barges but has experienced none, even during rough weather.

The water-displacement principle for filling and emptying the storage compartments has worked well. Nor, adds the company, has there been any emulsion problem, since the treaters reached the proper heat range.

Because the facility was designed for operation in 35 ft. of water, Calco scooped out a 10-ft.-deep resting place for it at the present location. The facility was found to be slightly out of trim at first, causing minor gauging difficulties, which were corrected by instrumentation changes.

So well has the S-93 performed, in fact, that Calco is having a virtually identical storage barge built by Bethlehem. The new one is scheduled for service in Ship Shoal Block 107 within the next few weeks.

One type of submerged storage unit, in use the past few months by Offshore Drilling & Exploration Co. off Louisiana, has proved so economical the company is planning another by late summer.

Odeco says the first unit, constructed by Higgins Inc., represents a cost of some $20 per bbl. for storage, as opposed to at least $50 per bbl. for above-water storage.

Essentially, the 15,000-bbl.-capacity unit consists of a huge rectangle of large-diameter tubes, with five cross compartments of the same diameter, all of which rests on the ocean floor, providing both storage and stability.

The above-water working platforms and decks are connected to and supported above the submerged portion by vertical members. It differs from the S-93 in that it doesn't use the water-displacement system for filling and discharging, depending, instead, on a pumping arrangement.

To hold the unit in place, Odeco has filled some of the cross members with water and has used rock ballast.

The new version will make use of reinforced structural concrete to give the unit both weight for ballast and added strength. It will be designed so that, when empty, it will just barely float.

Lease automation offshore has been proceeding much more slowly than had been anticipated. But gradually, here and there, it is appearing in at least partial form.

"It's true that, in many respects, lease automation would seem to be a natural offshore," says a representative of one major operating company. "The trouble is, the economics don't always look as good as you'd think. Because of the big cost of installing automation offshore, you have to have something more than just a saving in personnel to justify it. And it just isn't there in many cases."

Shell Oil Co. has initiated work in Eugene Island Block 18 on an automatic custody transfer system from storage that probably will be expanded to well production.

Heretofore, production from more than 60 wells has been flowed into tankage, then manually flowed into barges. The system being installed will provide for automatic pumping from storage, through meters and basic sediment and water monitors into barges, to permit a virtually continuous shuttle method of transporting the crude. But the system will eventually provide for automatic well-testing and other lease automation functions.

And the CATC Group is "studying very closely" the possibility of automating its six-platform, 38-well production facilities in the Grand Isle Block 47 field.

CATC has had a microwave system for communications in operation there since March, 1959. The proposed automation system would utilize this existing setup. But the project hasn't been approved, pending a complete study and analysis of all the factors involved.

Pure Oil Co.'s pilot-size microwave system, controlling production operations between two platforms involving three wells in Vermilion Block 39, and Gulf Oil Corp.'s system off the Texas coast, are reported to be functioning satisfactorily (PW—Feb.19'60,p61).

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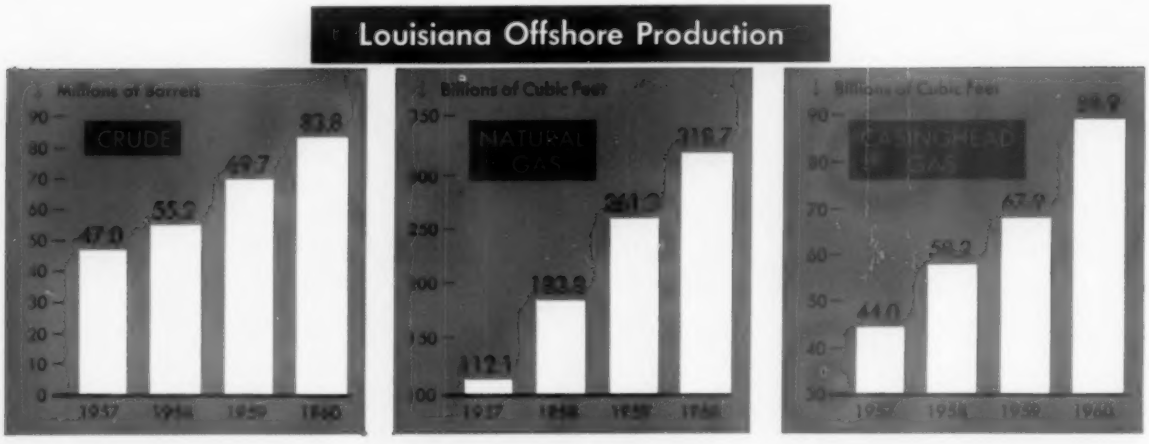

Mobiles Are Still Favored

Various factors favoring the use of mobile drilling platforms in the past probably will continue to make that type of offshore structure predominant in drilling in water depths of 100 ft. and more.

The common pattern in past offshore drilling in the Gulf has been the employment of mobiles for most of the exploratory drilling, and the use of either fixed platforms or the tender-and-platform method for development work. The fixed-platform technique still is being utilized, but on a decreasing scale.

Present activity and a survey of operating company plans accent the change in the pattern that has already led to greater use of mobiles, not only for exploratory drilling, but also for development work.

The indications are clear the trend will grow even stronger, and that it is beginning to shape up into something the operators will have to face before long.

Some of the mobiles, but only a handful, are capable of operations in waters out to between 100 and 150 ft. Platforms become impractical, according to present thinking, somewhere just beyond the 200-ft. water-depth mark.

It's reasonable to assume that something will be done to provide more drilling equipment capable of operating from the 100-ft. depth contour on out to the limit of practicality.

There is general agreement among offshore experts on this proposition—which, of course, is above and beyond whatever need is or may become apparent for the area of highest activity concentration—the waters within the 60-ft. line.

For the past few years, even talk about new drilling units has been muted. Now things are beginning to stir. It's only a slight movement at the moment, but even that contrasts sharply with conditions a year ago.

In many respects, the time seems ripe for a resurgence of the equipment-building program that was cut off by the drop in activity following the big surge of the mid-fifties.

The opinion of many offshore authorities is summed up this way by Alden J. Laborde, president, Ocean Drilling & Exploration Co.

"The steel people, the shipyards, the fabricators, and the supply firms are anxious for the business. Materials would be cheaper—there's no black market now. The time is favorable, and the equipment would be ready when it is time to move into the deeper waters."

Laborde notes that operators are willing to talk about the possibilities of new construction this year, something they saw little point in doing until recently. And in one or two instances, he says, they definitely seem interested in getting something going.

Jerome L. Goldman, vice-president, Friede & Goldman, New Orleans, adds: "I would think there is a distinct possibility that the need will come this year for maybe one or two units capable of hitting the 100-ft. water-depth range. Also, I do know the operators are going to need some equipment to go to the 100-200-ft. range—and that is going to be a realistic need. Several companies are talking about that."

But, Goldman continues, indications are that the industry won't need anything like that—floating drilling platforms—for two or three more years.

New Rig Designs Coming

But the relative inactivity of recent years has had some good points. Obsolete units, for example, are scarce now. And existing equipment has provided a wealth of operational experience. Designers, meanwhile, have been busy.

Such firms as Friede & Goldman, one of the most active designers of offshore equipment, have been able to work out new concepts. The New Orleans firm of naval architects and marine engineers has been designing and supervising construction of offshore equipment of various types during all stages of submerged land development.

Recalling the era of accomplishment, vice-president Goldman observes that the industry now has in service a wide array of successful units.

He adds that these units have anywhere from three to six or eight years of life behind them. "Together, they might represent 100 to 200 years of rig service," he says, "if you add up all the years they've been out there.

"Some things have worked out very well, some fairly

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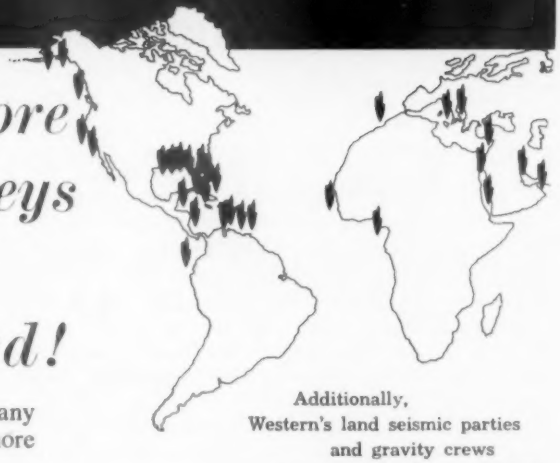

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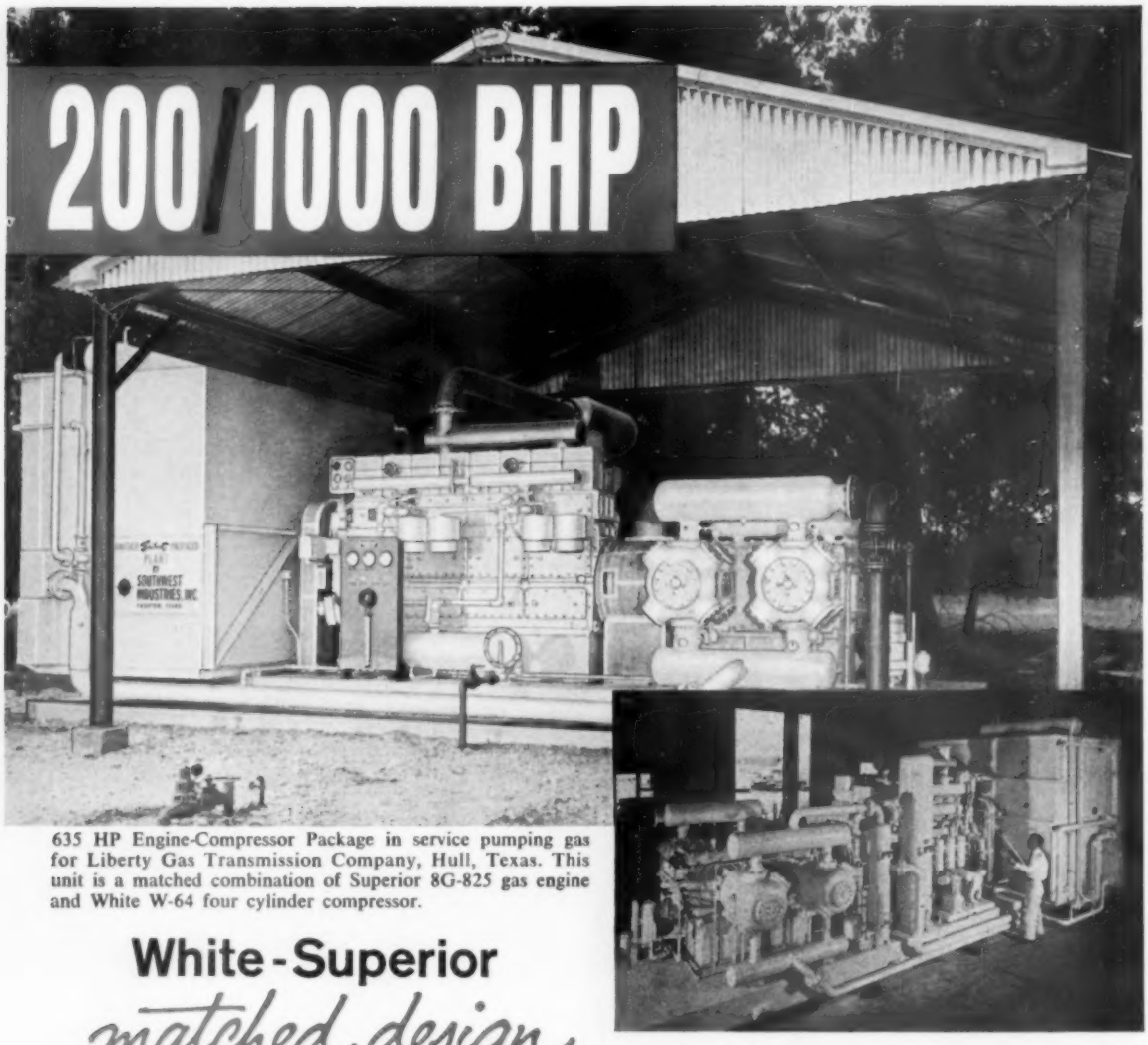

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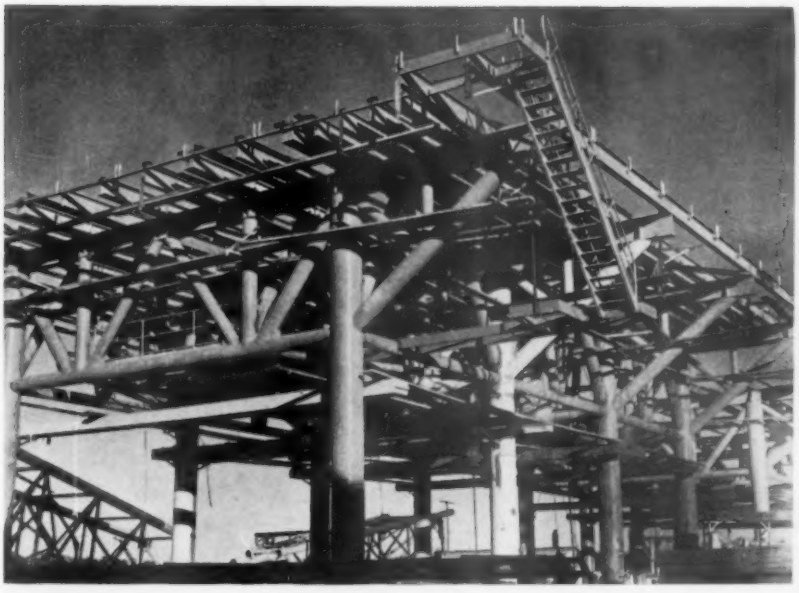

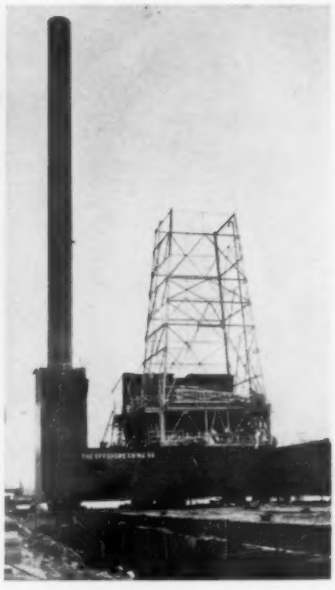

TAKING SHAPE in J. Ray McDermott, Inc., yard at Bayou Boeuf, La., are these various platforms. One with three legs for Offshore Co.'s No. 58 (right) is shown being positioned. The scenes typify the general upswing in current offshore construction work.

well, some almost on the miserable side, and a few have failed. Usually, when they failed, it didn't take them long. The sea is a tough taskmaster. Anything on land doesn't begin to compare. If you have any chink in your armor or any weaknesses at all, it will destroy you in no time.

"About 75% of the things we work out wind up encompassing ideas we've developed during those periods when we've taken it upon ourselves to research and develop the answers to problems."

The results have been what might be called the firm's concepts of the next generation of mobile drilling units. These are designed to provide more efficient and better exploitation of the offshore areas already under development, and, when the time is ripe, to permit successful operations in far deeper waters.

The mobile, fixed-height-deck, submersible-hull type may be the most satisfactory for waters to 100 ft. deep.

Goldman says the mobile is highly regarded because it is "unequaled" as an exploration tool for wildcatting and exploratory drilling. "Secondly," he adds, "many proven areas in the Gulf are highly faulted, and a fixed platform cannot readily reach a reasonable number of well locations. Stemming from the reservoir irregularities, it has been found on many occasions that, after several wells have been drilled from a large fixed platform, the producing company wishes the platform had been located a mile away." He explains that even in highly prolific areas, the mobile unit can often be a cheaper proposition, because it drills vertical holes rather than the costly directional wells necessary with a fixed platform.

The fixed-deck mobile also is able to function on very soft ocean bottoms because of the expanse of its submerged hull. "We've got a lot of mush out there," says Goldman. "This type of base is the only thing that will support a unit on such bottoms."

Goldman considers the fixed-height-deck, submersible-hull type of mobile unit, utilizing cylindrical, vertical caissons for stability, as "undoubtedly the most satisfactory" for this service, primarily because of the relative simplicity of submerging and raising it.

The improved unit would have substantially fewer structural members between the submersible hull and the elevated deck above it. This would be achieved by tilting the tops of its six caissons inward, permitting a new arrangement of supporting members beneath the upper deck.

Actually, this type of mobile can be built for various water-depth ranges, the major difference being the size of the component parts.

There is a direct correlation between the height of the legs (which determines the suitable depth limit) and the dimensions of the submersible hull or mat. The higher the legs, the larger the mat. The hull on a unit designed for 50-ft. depth or shallower waters would have a 120-ft. width, while a 100-ft. unit's mat would have a 180-ft. width.

New designs for units of any depth range could trim construction costs substantially.

In comparison with the $4-million-plus to as much as $10-million ordinarily considered as being in the ballpark for units capable of drilling in 100 ft. of water, Goldman says his firm's design means "we're talking about something that, all complete, should run some $3¼-million to $3½-million."

For the smaller, shallower-depth unit, he adds, the cost is expected to run "well below" that previously experienced for comparable equipment.

Goldman continues, "We've also developed some new construction techniques that we've discussed with builders

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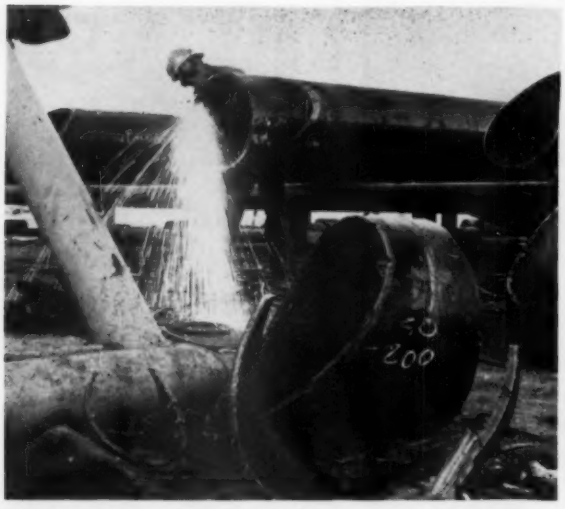

FABRICATING YARD WORKER shapes end of piling that will be used as one of the legs to support an offshore structure.

YARD ACTIVITY like this has picked up substantially compared to a year ago. And even stronger activity is expected.

for fabricating such a wide hull," which would help to drop the price.

For successful operation in water depths between 100 and 250 ft., the more complicated self-elevating deck—the "jack-up barge"—may be the more practical answer.

Goldman says, "We have to return to the spud-type principle once we get past the 100-ft. depth because the fixed type becomes just too enormous to do much with. To just about double the current range, we have developed another type of unit to operate in the 200-225-ft. range. We haven't gone at it just to double the range, but also to increase the workability."

The superdepth unit would be characterized by a fairly long and fairly wide hull.

Most of the machinery, storage space, and the like, would be within the hull, or deck, which would be elevated by a hydraulic jacking mechanism "quite similar" to those now in use.

The outstanding characteristic of this very-deep-water unit would be four huge, template-type square spuds—each of them as high as a city block and 40 ft. square.

The use of the template principle is aimed at the double objective of securing great rigidity during drilling, yet achieving maximum stability when the legs are jacked up and the unit is being moved.

Each of the 320-ft.-long spuds is enclosed, with a solid "cap" at its foot, covering some 1,600 sq. ft.

This huge bearing area should enable such a barge to work in softer bottoms, "plus the fact that these cans [caps] will pick up some displacement as they press into the mush down there and provide buoyancy," says Goldman.

He says the template-type construction for each of the vertical legs will mean a high degree of rigidity while the unit is on location. Yet, because of this construction, weight of the legs is reduced tremendously, helping the barge to withstand heavy seas when afloat.

Such a unit could operate in some 200 ft. of water during the hurricane season and in around 225 ft. of water in the nonhurricane season.

On location, some 20 to 30 ft. of spud length would be shoved into the sea bottom, and some part of its length would remain above the elevated deck.

During the nonhurricane season, the deck would have to be raised only 25-30 ft. above the waterline, leaving more than sufficient spud length to permit drilling in at least 225 ft. of water.

During the hurricane season, with the deck elevated some 50 ft. above the waterline, the unit could still operate in a water depth of around 200 ft.

It's estimated this type of unit could be built for roughly $5.5-million.

"It's really an extension of what has been very successful out there—the jack-up type barge—but a development that keeps economics in line," says Goldman.

Beyond these depths, the floating drilling platform is seen as the best bet, since this type appears to have virtually no limitations as to water depth.

A modified version of the fixed-height-deck, submersible-hull unit is Friede & Goldman's approach in this area.

Previous experience with floating equipment in the Gulf hasn't been altogether satisfactory, operators report. The up-and-down and lateral motion encountered inhibits normal drilling. Several studies have been made of wind and wave action on platforms, underscoring the significance of the problem (PW—Jan.20'61,p22).

During moves, existing versions of the fixed-height-deck, submersible-hull barge have demonstrated very stable characteristics, because much of its bulk and weight is submerged, minimizing wind and wave action.

Customarily, during moves between locations, the submersible hull isn't raised all the way, but is left in a submerged position.

"Several of the owners have asked me about this," says Goldman. "They have noticed that the platforms are won-

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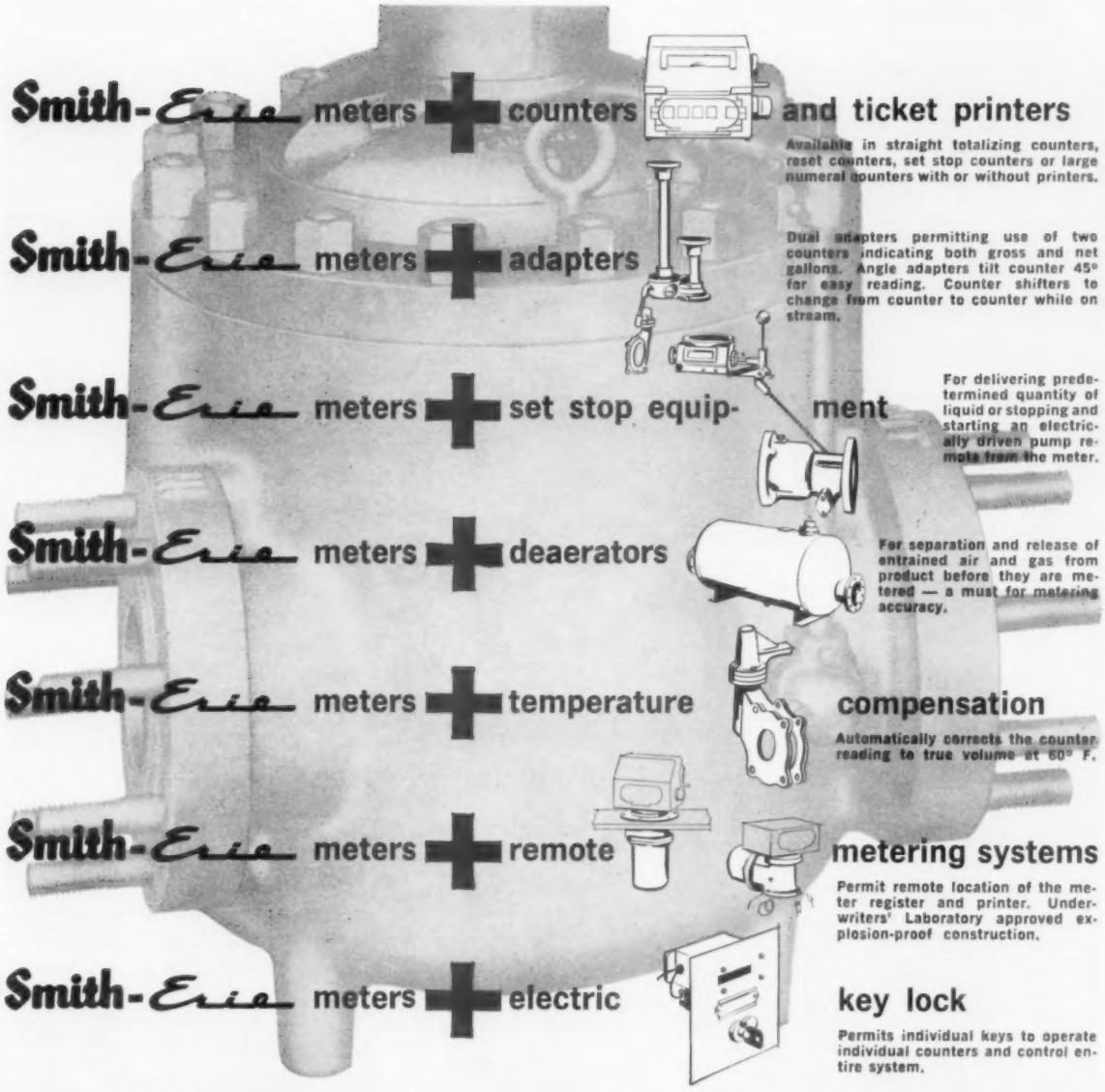

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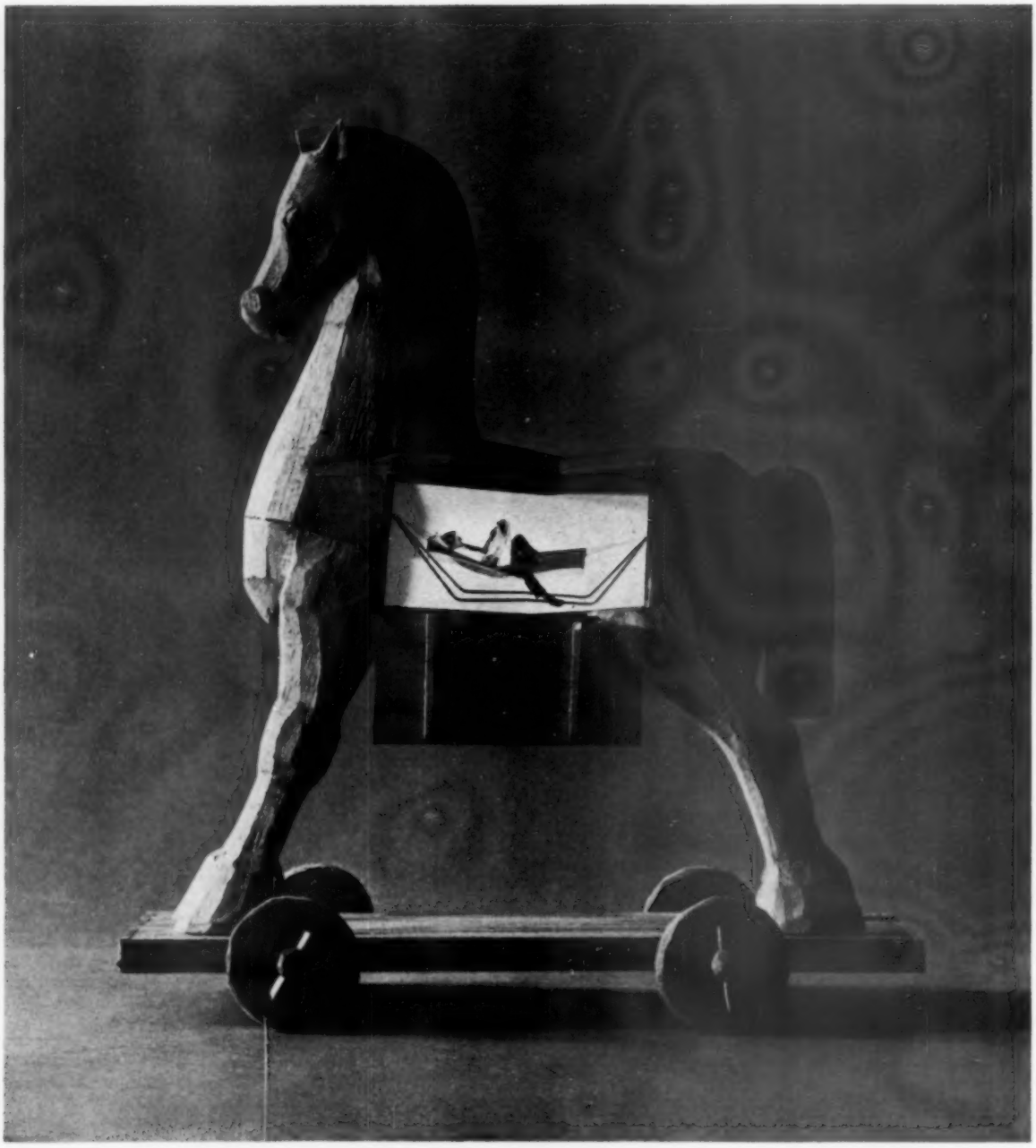

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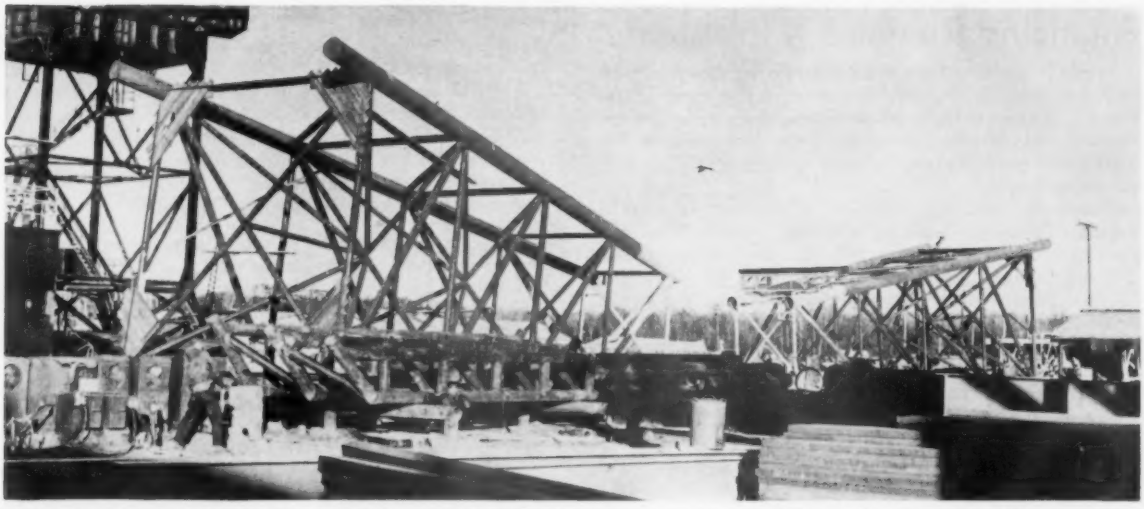

MORE OFFSHORE PLATFORMS are being completed in this yard to meet the steadily increasing demand of offshore activity, which may reach peak levels this year. The push to deeper waters also is intensifying efforts to develop suitable structures.

derfully stable, even under storm conditions. The things just sit there like rocks. The operators have asked if it wouldn't be feasible to just anchor the thing somewhere, since it sits so steady, and go ahead with their drilling.

"It could work, but what they're really seeing is the seed of a basic principle that we think will work—a principle whereby there is a shaped hull well below the waterline. There is some widespread buoyancy or cylindrical caissons on which this thing rides, and, when the waves go by, it hardly moves at all. Yet there is a drilling deck that is elevated above the wave area.

"On this type of unit there would be almost no motion in anything except a heavy storm wave. Once it gets that bad you'd just have to shut down, but they've been doing that all along in the tender-and-platform type of operation. And this type of floating platform would be stable enough for drilling in considerably higher waves than that. In a 15-ft. wave, for example, it might move one degree, or something like that."

Anchoring is the really big hitch to successful employment of floating drilling platforms.

"Such a unit will work and be wonderfully safe and stable out there," continues Goldman, "and there would be no limit, then, to the water depth. I'd say the work would have to be done in the mooring aspect."

He notes that the action is minimized the deeper you go in water, but that when there is much exposure, "you're still dealing in forces that no mooring we've ever devised can hold against."

Friede & Goldman installed a 15-ft. offshore loading buoy five years ago for one operator, and Goldman reports that difficulty is still being experienced in maintaining the anchoring system. A drilling platform, he adds, is a much bigger problem. "This is heavy work," he continues, "handling tools with great mass. If they get any swing at all to them, they become unmanageable."

Other look-ahead designs are ready to move from the drafting board to the fabricating yards. One such is a new type of floating drilling platform.

Ocean Drilling & Exploration Co. has prepared a concept that would be in the form of two wings joined at a right angle, with the drilling deck and derrick cantilevered over the water, on the inside of the angle.

The platform would consist almost entirely of large-diameter templated pipe and caissons. Buoyancy would be achieved through the use of a horizontal system of 60-in. pipe that would remain submerged, thereby serving as a stabilizing force as well.

On location, the platform would be anchored with lines run out from the point of the right angle and the ends of each wing, with drilling taking place through a vertical jacket lowered through the water to the ocean floor and held in position by driven pilings.

The columnar structure would offer little exposure at the waterline, minimizing lateral forces. Large "cans" (hollow vessels), 10 ft. high and 14 ft. in diameter, mounted on structural members between the submerged portion of the platform and the upper part, would ride half-submerged and boost the structure's load capacity during drilling. A system of compartmentation and pumps would permit leveling. Odeco's Laborde estimates that the floating barge would cost around $3-4-million.

The floating structure has been planned as a sort of double-purpose drilling platform, for economical use in either very deep or relatively shallow waters.

"It gives us a hedge," explains Laborde. "The design wouldn't tie the unit to the deeper water. If things got slow, drilling-wise, out there, we could pull back to the shallower waters, where it will operate just as well. At the same time, the cost should be such that we could compete economically with units designed especially for shallow-water work.

"We'll have sufficient height between the submerged hull and the upper deck to permit us to work as a conventional submersible mobile platform, out to around 90 ft., then as a floating barge from there on out."

continued ▸

Financing Remains a Problem

While it appears that structures can be designed and built for virtually any offshore need in the near future, there is a serious doubt about financial incentives. Contractors will have to demonstrate the soundness of the investment, and the certainty of a reasonable payout, to secure loans.

That's the picture painted by a variety of people in different fields—engineering, insurance, construction, contracting, and others—connected with the offshore effort.

Some financial backers took a beating when the big offshore boom of 1957 turned into a scramble shoreward. Some of them, at least, want to see written evidence that a contractor has been assured sufficient work in advance to pay out the cost of any new unit, regardless of its mechanical perfection.

"And you don't see any more of these outsiders running around with money in their hands, begging anybody with any kind of knowledge about offshore at all to take it," commented the head of one contracting company. "Back during the good old days, I used to run into that kind on the street. But not any more."

Goldman, who has been talking with financial men himself, thinks that it will take contracts not only committing the operator to keep the unit busy "for a specified time," but also containing a clause requiring the operator to sue in court for release—"not a contract that permits the operator to terminate simply because he's dissatisfied."

Others don't feel it will be necessary to go that far, but all agree that financing a unit today is a tough proposition.

The operating companies, on the other hand, don't seem inclined to, or can't, furnish any ironclad guarantees.

"The companies can't guarantee a drilling program," flatly says a high official of one major that is very active offshore. "How can we? How can we know what a new prospect will turn out to be? You hit with a good one, and you go into a development program. You miss, and there is no development program. And, don't forget, every venture out in the deep water is going to cost more. We simply can't afford to commit ourselves to any long-term drilling contract.

"When we first started offshore, we did that. We had to subsidize the building of some of those units in order to get them into the water. And it worked out all right. But we were lucky. We got onto some nice acreage. Since then, we've missed on some, too. We just simply can't say we can give a contractor two years of work."

But some contractors counter this reaction by arguing that, if the operators want new units, they'll have to support them.

"The operators are taking a short-sighted viewpoint," charges one contractor. "They're not inclined to assume part of the risk with new equipment."

Some go further and assert that the operators have taken advantage of the competitive situation and are forcing contractors to wear out drilling equipment under forced-draft operations and at contract rates much lower than they should be.

One contracting firm official says the rates of penetration have been reduced drastically at the cost of running drilling equipment at the manufacturers' rated specifications.

"In a pump, for example, that means the rated specifications at the gear end," he explains. "But what about the liners, rods, cylinders, and so on? They wear out, and that costs us money."

He adds that his firm formerly averaged $46 per day of operations for pump repairs, and that that average now is $82 per day. Engine repairs, he continues, which formerly ran some $15 per day, have shot up to over $50.

"And I am restraining myself from discussing drillpipe and drill-collar replacement costs," he adds.

The crux of the matter, as usual, is economics. The contractor must be able to justify the investment.

"The trick is to justify the payout to yourself before you ever go to the bank," says one contractor.

Here is a hypothetical example of what the contractor contemplating the financing of a $4-million unit capable of operating in 60 to 80 ft. of water is faced with:

Figuring on 6-7-year amortization, he must consider a depreciation rate of around $700,000 per year. The annual cash cost to operate the unit, including insurance, at $2,500 per day, comes to just over $900,000. An optimistic view on the interest would put it at 6% (and the contractor would be very lucky to get that), for an annual payment of $240,000.

So the contractor would have to proceed on the basis of a yearly total of $1,840,000 for operating costs and depreciation.

Calculating on the basis of keeping the rig busy 320 days per year—again optimistic—the contractor would have to charge around $5,800 per day to break even.

In order to make a reasonable return on his investment, the contractor would have to charge between $7,000 and $7,500 per day ($2,240,000 to $2,400,000 per year).

On a full 365-day basis, he could lower the rate to around $6,500 per day ($2,372,000 per year).

However—and here's the rub—big rigs are operating offshore today on a $5,000-per-day basis ($1,600,000 on a 320-day basis).

On the other hand, the operator has an economics problem, too. What can he afford to pay for digging a hole?

One contractor who can see both sides of the question puts it this way:

"All this gets an operator is a hole in the ground. If it is a producer, the well can be produced at only a certain rate. Offshore, it is more expensive to produce and transport the oil.

"And, when it gets to shore, the oil has to compete with all other crudes, domestic and foreign. So what can the operator afford to pay for digging the hole and still make a profit?"

Of course, there is no problem if the contractor can handle the financing of new equipment himself and has work lined up for it.

Offshore Co., Baton Rouge, for example, is building Offshore Rig No. 58 "with our own money," as one company official puts it. This unit is destined for service off Central America, initially.

Offshore says it has several future construction plans in mind, including some units of advanced design.

Deals between operators and contractors provide one solution to the economics dilemma.

continued ▸

Commenting on this possibility, Odeco's Laborde says, laconically, "We're ready. All they've got to do is to assure us the business is there—not even make a long-term contract—just enough to keep us busy for a year or a couple of years or so. We'll go ahead and build the rig and take the rest of the risk.

"We'll make deals, take acreage. We've done that in the shallower water, and we can do it in the deeper water. I know of other companies like ours who will do the same thing."

There isn't anything new in this procedure, onshore or off. In fact, many of the contractors who first went into offshore work had this objective clearly in front of them. Some now are sharing in offshore production, others are not.

Laborde thinks the difference was largely a matter of "timing." Odeco, he points out, was among the first to enter the offshore drilling picture. "We hit the ground running, and the momentum carried us farther than we might otherwise have been able to go. Others came in at a time that was peak-wise for costs and expenses, and never got into the cream on the other end."

During 1960, Odeco had one of its most successful periods, kept its five fixed-height-deck submersible mobiles busy "at satisfactory rates," and experienced "a significant increase in production income," as well as acquiring additional offshore acreage, including one 33,000-acre block. It already is operating some offshore acreage.

This year, the firm is planning an ambitious exploration and drilling program, which, it hopes, will increase its production income and leave it "with a strong acreage position for more development in the future."

While its offshore production is beginning to have a "considerable effect" on earnings, Laborde feels the company cannot count on its carrying the load. He believes the wiser course is the conversion "of money into reserves."

"There is a time to acquire this stuff [reserves], and this is one of those times," he explains. "It's the same stuff, whether you pay $10-million for it, or somebody gives it to you."

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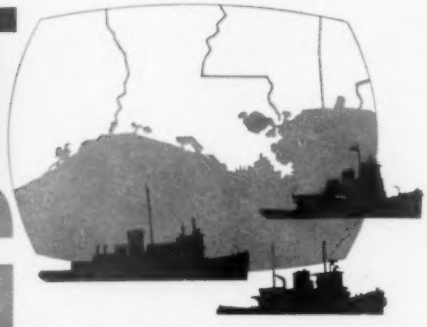

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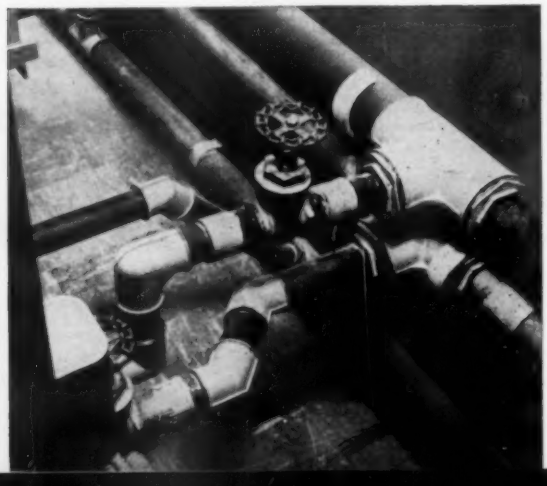

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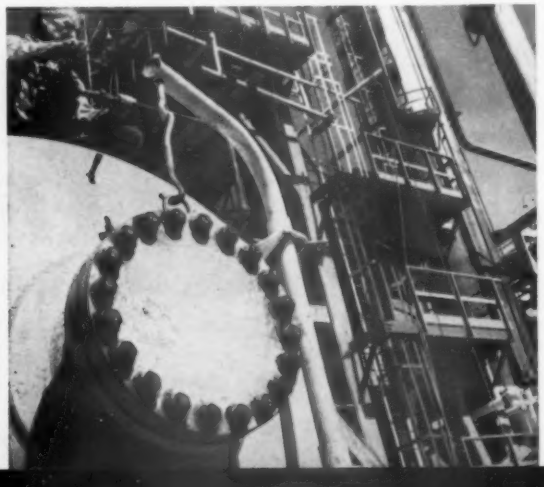

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Wall Thickness (B.W. Gage)	Minor dimension of the defect (Length or Depth)	Defective Area (Length, Depth Plane)
20	.006"	.0025 sq. inches
18	.006"	.003 sq. inches
16	12½% of wall	.003 sq. inches
14 and 13	12½% of wall	.004 sq. inches
12 and heavier	12½% of wall	.005 sq. inches

FARROWTEST detects and rejects not only tubing containing defects which completely penetrate the wall; but also tubing with defects equal to, or greater than, those shown in this table. For irregular defect shapes, a tube with defect area equal to or greater than shown above is rejectable. Where required, sensitivity of FARROWTEST equipment can be calibrated to reject defects of lesser specified area than shown in table, at extra cost.

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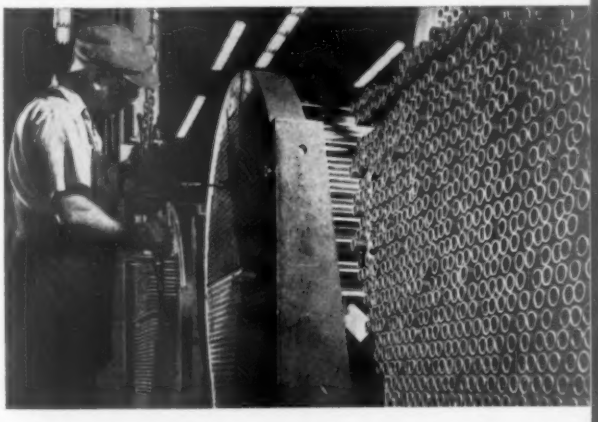

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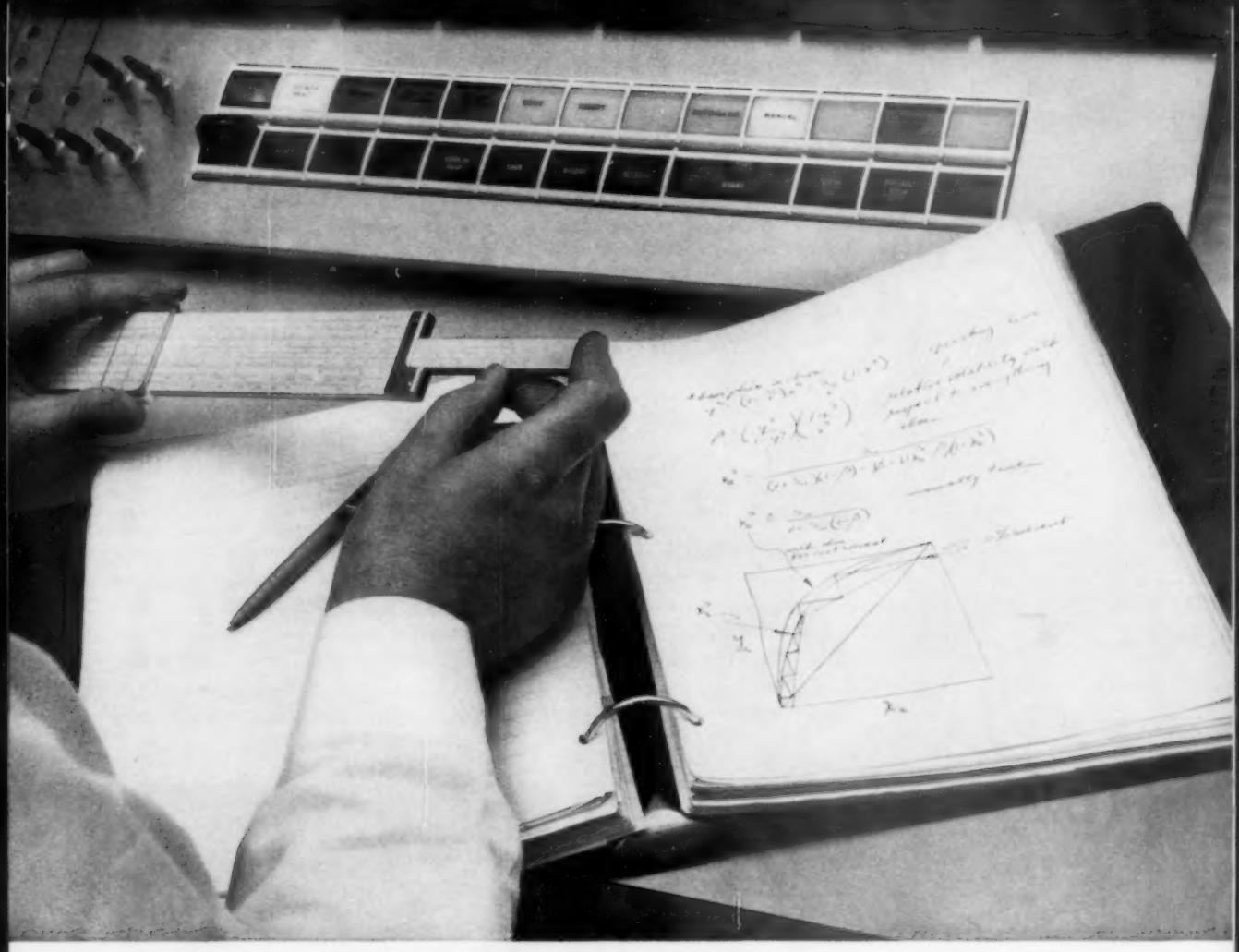

Solve vapor-liquid equilibrium problems quickly, easily with the new low-cost IBM 1620

You can now perform unit operations calculations in minutes with IBM's new Unit Operations Simulator for the 1620. The Simulator consists of 13 automatically available sub-routines*. These are short programs stored in the machine which can be called on to solve your vapor-liquid equilibrium problems.

Included also is an interpreter which allows you to link together the sub-routines you want to use for the problem you are working on at the moment. The *language* of the interpreter is symbolic. This makes it easy to use and eliminates the need to write a detailed program in machine language.

The Unit Operations Simulator is available free of charge to all users of IBM 1620 Data Processing Systems. A basic 1620 rents for just $1,600 a month. Ask your local IBM representative to give you complete details on this versatile, low-cost engineering computer.

IBM's 1620 is a compact desk-size computer.

*Here's what the Unit Operations Simulator does for you: **1.** Computation of equilibrium constant. **2.** Computation of temperature from a given equilibrium constant. **3.** Computation of enthalpy of a vapor and/or liquid stream. **4.** Find equilibrium constant nearest unit. **5.** Computation of temperature from a given enthalpy of a vapor and/or liquid stream. **6.** Bubble point and dew point calculations. **7.** Split one stream into two at specified ratio. **8.** Mix two streams of same phase. **9.** A mixed feed adiabatic flash calculation. **10.** Adiabatic flash. **11.** Isothermal flash. **12.** Flash to a specified quantity of vapor. **13.** Absorber/stripper calculation using Edmister short cut.

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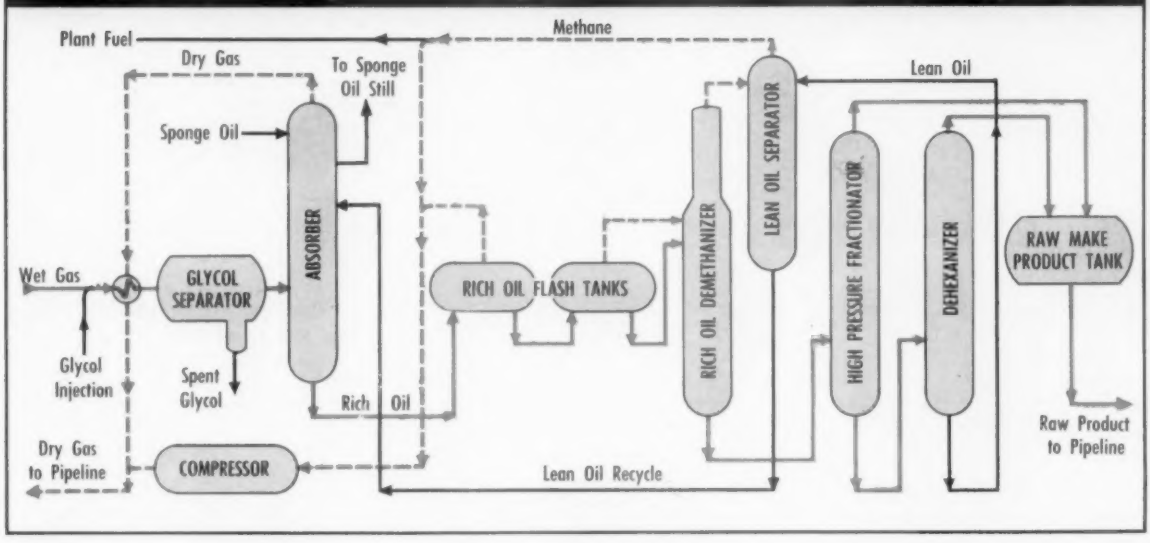
How Goliad Corp. Extracts Liquids from Wet Gas at Cow Island, La.



For natural gas liquids plants . . .

New Conditions Call for New Methods

Newer, leaner gas streams now being discovered in the U.S. dictate different approaches in the design of natural gas plants. The joint project of Union Oil Co. of California and Goliad Corp., recently put on stream in Louisiana, exemplifies the latest trends.

At the recent Gulf Coast meeting of the Natural Gas Assn. of America, in Corpus Christi, Tex., Goliad's Harvey Dunn described the manner in which large quantities of natural gas from Southern Louisiana, containing about 0.6 gal. of natural gas liquids per 1,000 cu. ft., and costing over 20¢ per 1,000 cu. ft., are being handled in this joint venture.

The first principle is to locate the fractionation and blending facilities in the area of product demand. This often means a splitting of the extraction plant and the fractionation plant.

Such a division will avoid a useless handling of huge volumes of gas, and minimizes backtracking. It generally results in substantial savings.

In the case of Goliad, the extraction facilities are in the gas field at Cow Island, in Vermilion Parish. The fractionation plant is at Riverside, on the east side of the Mississippi, in the industrialized portion of Louisiana between Baton Rouge and New Orleans.

The two plants are connected by 86 mi. of pipeline: two 6-in. end sections, and an 8-in. midsection, laid across the swamps of the Atchafalaga Basin (PW—Dec.2'60,p44).

The second principle is to use low temperatures for the oil absorption process in the extraction plant.

This, Dunn said, reduces substantially the amount of oil that must be circulated in the plant. As a result, smaller oil pumps, towers, and heat exchangers are required—an over-all saving in plant investment even when the additional cost of refrigeration is included.

At the Cow Island extraction plant —built by Fluor Corp., Ltd.—450-million cu. ft. per day of gas are processed at a temperature of —40F. About 90% of the propane, 20% to 25% of the ethane, and all of the butanes and heavier hydrocarbons are separated (diagram).

A combination of a low-molecular-weight absorption oil and a "sponge oil system" frequently proves to be economical in the extraction plant.

A low-molecular-weight lean oil (100 molecular-weight oil is used at Cow Island) results in greater absorption per unit of volume, Dunn pointed out. But more of that oil will be lost at the top of the absorber through equilibrium vaporization, even at —40F temperature.

To recover the oil, a few top trays of the absorber are reserved for an oil of 140 molecular weight. This sponge oil picks up the 100 molecular-weight oil out of the gas, and goes to its own recovery system, where the lean oil is separated and returned to the cycle.

Plastic components are frequently used in modern designs, as, for example, in the cooling system.

The induced-draft cooling tower at the Cow Island extraction plant, with a capacity of 11,000 gal. of water per minute, has polyethylene grid elements, instead of the conventional redwood fill.

A third factor in the economy of modern projects is an extensive use of instrumentation.

Both the extraction and the fractionation plants are highly instrumented, and need a minimum of attention.

Only two operators per shift are required at Cow Island, and one per shift at Riverside.

A process chromatograph is used for automatic monitoring of the extraction process.

The Riverside fractionation plant is even more instrumented. There, the operator can control 48 different temperatures from his central control

room. A recording process chromatograph automatically analyzes all product streams every five minutes. And the reflux rate of the butane splitter—or de-isobutanizer—is controlled by a differential vapor-pressure controller, installed in the top section of the tower.

The acidity and concentration of the cooling water also are controlled automatically.

High fuel efficiencies are strongly emphasized in modern recovery plant designs.

Most of the energy normally wasted in older gas treatment plants is recovered in modern facilities.

For example, Dunn remarked, the energy lost in reducing the pressure of the rich absorption oil amounts to a sizable horsepower consumption in most plants. At Cow Island, part of that energy is recovered by hydraulic turbines, which assist in driving the lean oil pumps; they supply as much as 25% of their power requirements.

Likewise, the bulk of the fuel gas coming from the rich-oil demethanizer, at nearly 500 psi., is reduced to a pressure of 35 psi. before entering the fuel system. That reduction is accomplished by a 193-hp. gas turbine, which drives a boiler feed-water pump.

Polyester Resins Have Versatile Appeal

Consumption of fiberglass-reinforced plastics (FRP) should reach a level of 500-million lb. per year by 1965. And over 300-million lb. of these plastics should be polyester resins, according to James E. Sayre, of the plastics division of Allied Chemical Corp.

Sayre made this prediction last week at the 16th annual Reinforced Plastics Conference of the Society of the Plastics Industry, in Chicago.

The spectacular growth of the FRP industry, Sayre pointed out, took place entirely within the 1950-60 decade. Some 278-million lb. of reinforced plastics were consumed in 1960. This included 190-million lb. of polyester resins—and about 70-million lb. of glass.

Polyesters can be either of the saturated or the unsaturated type.

Saturated polyesters, or alkyds, are linear products, made by reacting a polybasic acid and a polyol—for example phthalic acid and glycerol.

Unsaturated polyesters are also condensation products, but they can be converted into branched resins, usually with a peroxide catalyst, which gives them much greater mechanical strength, as well as heat and chemical resistance.

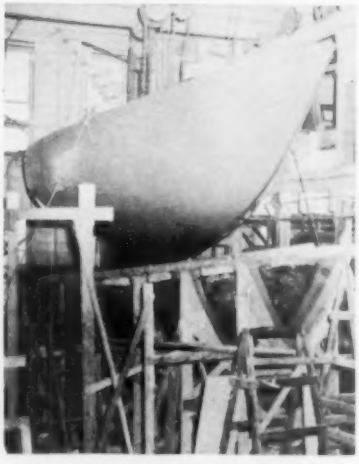
Polyester resins used for reinforced plastics consist of mixtures of polyesters, plus suitable monomers (such as styrene, methyl methacrylate, or duallyl phthalate), catalysts, and inhibitors.

Polyester resins are unique petrochemicals in that they do not draw heavily on any single raw material from refineries. The raw materials required for polyesters are also consumed in other large-selling products.

To illustrate, Sayre explained that polyesters today use only about 3% of the U.S. styrene output, only 5% of its phthalic anhydride, 20% of its propylene glycol, and possibly 40% of all the maleic anhydride produced.

Each of these raw materials is produced at many points around the country and is freely available in bulk at prices varying from 12.5¢ to 22.5¢ a lb.

These factors place polyesters in a very different situation as compared to other petrochemicals that use, for example, large amounts of a single monomer.



REINFORCED-PLASTIC hull of a 38-ft. ocean-racing yawl is being lifted from its mold. The ship, made by Pearson Corp., Bristol, R.I. has many unusual features made possible by the use of fiberglass reinforced plastics.

There are many reasons for the growing popularity of polyester resins. Outstanding are their strength and their light weight.

Parts fabricated from reinforced polyester resins are lighter than aluminum parts and yet, for many purposes, stronger than steel. They are resistant to erosion, rust, chemicals, solvents, salt water, weather, rot, and exhaust fumes.

The only plastics that come close to polyesters in the reinforced plastic field are the epoxies. In many cases, these give polyesters serious competition, C. H. Strong and J. J. Madden, of Union Carbide Plastics Co., told the SPI meeting.

Polyesters play an important part in the field of aircraft and missiles, and are being used more and more in the automotive industry. But their greatest single application is in boat construction (picture).

In 1960, about 55-million lb. of polyester resins, or 20% of their total consumption, went into boats, while 50-million lb., or 18%, went into automobiles and trucks.

Sayre estimated that the share of FRP in boats will be as high as 29%, or about 139-million lb., by 1965.

This optimistic view was shared by most exhibitors at the recent 51st National Motor Boat Show, in New York: They estimate that the yearly sale of boats will rise from 400,000 units in 1960 to 500,000 units in 1965, and that about 300,000 of these will be made of reinforced plastics.

Foreign competition does not seem to be a serious obstacle: About as many plastic objects are being exported as are being imported.

This condition, according to Sayre, is due partly to the fact that, while labor wage rates are substantially lower in Europe than in the U.S., productivity is lower there too. For example, in Norway wages are 33% of U.S. wages, but productivity is only 39%, resulting in an 84% cost of production. In Italy, wages are only 24% of U.S. wages, but productivity is only 32% of U.S. productivity, resulting in a 75% production cost, all other factors being equal.

The use of reinforced polyester plastics is also increasing in many other fields. Among the uses for which they are making the greatest progress are: architectural sheets and boards, electrical insulating material of great impact strength and resistance to moisture, consumer products and appliances, swimming pools, and concrete forms.

And about 10-million to 12-million lb. of nonreinforced polyester resins were sold in 1960 for putty and adhesives, for buttons, and for coatings.

The largest petrochemical plant in the world stands on the west bank of the Mississippi, just north of New Orleans. Built from grass roots with a total capital investment of approximately $100,000,000, this giant complex includes production facilities for **acetylene, acrylonitrile, ammonia, ammonium sulfate, HCN, hydrogen, oxygen** and **sulfuric acid.** Responsibility for the design, engineering and construction of the entire project was in the hands of Chemico.

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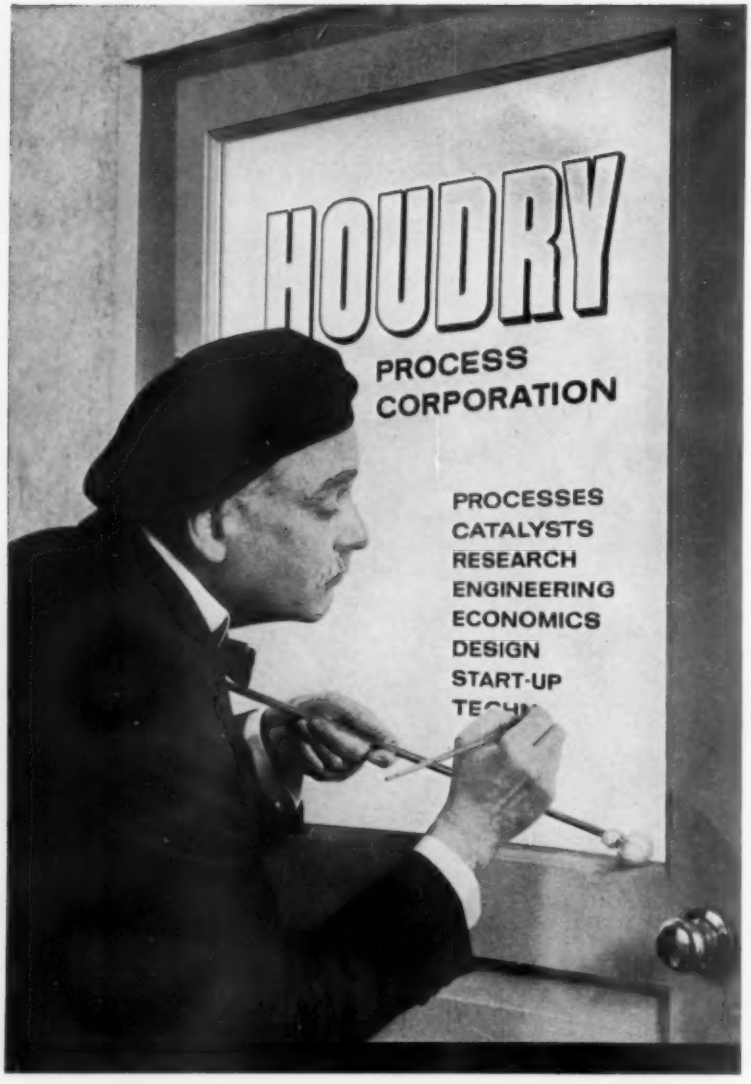

ADDING TO THE LIST OF HOUDRY SERVICES

A good many petroleum and chemical processors have found profitable reading in the growing list of "what Houdry does."

Availability of contract research, for instance, enables processors to "farm out" projects ranging from development of theories to pilot plant tests of processes and chemicals. Houdry contract technical service helps keep plants operating at peak performance levels.

And while you may contract for one or more *specific* services, you can often derive additional direct benefits from *other* services and other phases of Houdry's operations at the same time. Your contact with any section of Houdry's technical service group also makes the experience and knowledge of the *whole* group available for application to your requirements.

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What's New
IN PROCESSING

Oxo Chemicals Co., a new company jointly owned by Pittsburgh Chemical Corp., and Amoco Chemicals Co., will construct an isooctyl and decyl alcohol plant at Haverhill, Ohio. Annual capacity will be several million pounds.

The plant has been designed to use the Oxo process, which produces high-molecular-weight alcohols from inexpensive refinery byproducts (PW—May22'59,p28).

Construction of the Haverhill plant will begin this spring; completion is slated for early 1962.

•

Ethylene capacity at Humble Oil & Refining Co.'s Bayway refinery, Linden, N.J., will be expanded by 35%, bringing it to 175-million lb. per year. The expansion is expected to be completed in 1962.

The company's total ethylene producing capacity will then be about 845-million lb. per year, of which 250-million lb. will be consumed internally.

•

A 12,000 b/d kerosine hydrotreater is being added to the facilities at Texaco's Port Arthur (Tex.) refinery. Fluor Corp., Ltd., began construction last month; completion is slated for the middle of the year.

•

A 22-million-lb.-per-year phthalic anhydride plant will be built by Dominion Tar & Chemical Co., Ltd., adjacent to its other facilities in Toronto.

The plant will use the fluid bed process (PW—Nov.4'60,p34). The company says the process will give higher yields and produce a higher-grade product.

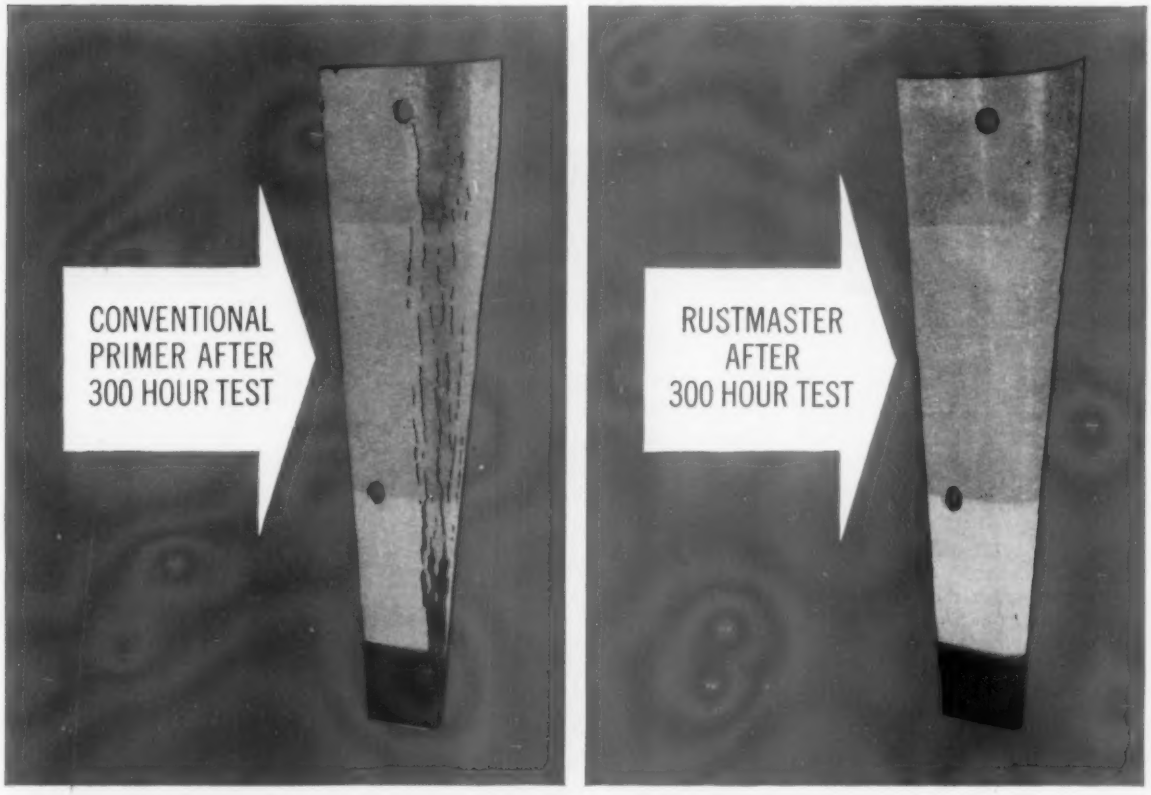
Canadian Badger Co., Ltd., is contractor for the $3.5-million project, which will be completed in 1962.

•

A one-week course in radiation safety will be offered by the National Safety Council in cooperation with the Atomic Energy Commission in Chicago, beginning Feb. 27.

The course will include a day at AEC's Argonne national laboratory, near Chicago, for demonstrations and practice in the use of instruments and monitoring.

Rustmaster Metal Primer is 27% more corrosion resistant



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Tests prove that RUSTMASTER is 27% more effective; it gives a stronger, more flexible, more corrosion-resistant finish.

RUSTMASTER Tank and Structural Primer molecules—containing a special wetting additive*—penetrate all the way through rust, carrying *both* vehicle and anti-corrosive pigment to the bare metal surface. Corrosive air and moisture are forced out.

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The Oil Industry Makes a Big Move

Black boxes, sound effects, brass pegs, and computers: They've all become part of a new approach to training in the oil industry. The key word in this new approach is simulation.

Oil companies are discovering that they can give their trainees and researchers the "feel" of the industry in a short time, by reconstructing some of the main features of an oil field, for example, a service station, or a refinery.

Black boxes have thus become alcohol plants, sound effects have been used to create the atmosphere of a service station, brass pegs have become drilling rigs, and computers have become replicas of the entire industry.

Next month, a group of oil men from the Society of Petroleum Engineers will take part in this new trend. They'll play a game at Southern Methodist University that simulates competition in the oil industry.

The group will divide itself into a half-dozen teams, each representing major oil companies, with an additional team playing the part of all the independents in the industry.

By making quarterly "moves," such as increasing crude runs or lowering product prices, the players are taught to think in terms of long-range objectives—to get the feel of the company president's job.

Standing on the sidelines, acting as a sort of electronic referee, will be a UNIVAC 1103A computer. It will compare the moves of the players to what it "understands" of the industry.

In a matter of minutes, it will show how each of the moves interacted on the competitive position of each player.

The UNIVAC has been programmed to reflect the historical activity of the oil industry over 12 years —from 1947 to 1958.

The game, which was originally created at Oklahoma University, is now a "top management" exercise. But it can be easily converted into a "middle management game" or a "production game" or a "refining game," simply by letting the players make detailed decisions at each of these levels. Such decisions are now built into the model, and are, in effect, made by the UNIVAC.

A GAME FOR EACH SEGMENT of the industry has been developed—some by oil companies and some by universities. Everyone, from dealers to managers, can play.

While the SMU game simulates the entire industry, a game created by scientists at Esso Research & Engineering Co. represents a single unit in a single refinery.

The purpose of this game is to study various strategies of empirical research.

The game is housed in two black boxes. In one box, which faces the researchers, are five dials. These dials control a meter located in a second box, monitored by a referee.

At the start of each game, each of the five dials is set at 50, and the meter reads 24%, which represents the "yield" of an imaginary alcohol plant.

Some of the more than 60 teams that have tried to increase this "yield" have elected to switch one or two dials at a time, while others have used more designed experiments.

The results of playing this game have been interesting: They have pointed up some of the mistakes scientists are apt to make in adopting research strategies.

Because the players are "charged" for every experiment they run, some become timid—seldom do they move the dials over their full range (0 to 85).

Some get into a rut. One team, for example, doggedly stuck to a setting of 65 for one variable, thinking it

Into Business Games

was correct, when the best setting was 18.

Some teams lack a feel for error—which is injected arbitrarily by the referee using a sixth dial—while others seem to think consistently in terms of linear or straight-line relationships.

Unimportant factors are often not weeded out: None of the teams discovered that the fourth dial had absolutely no effect on the yield reading.

There is another refinery game that is played by technical people at Humble Oil & Refining Co.'s Baton Rouge refinery as part of their regular training program.

It's a pencil-and-paper game designed to teach the financial aspects of refinery operations.

Eight teams bid for crude, run it through their plants to produce gasoline and heating oil, and bid for sales at the marketplace.

The players may, if they wish, recycle their heating oil to get higher yields of gasoline. But in so doing, they must accept higher operating costs.

A random growth factor is injected into the game after each period, with one period representing summer and the other winter.

The game has recently been "exported" to Creole Petroleum Corp., an affiliate of Standard Oil Co. (N. J.) in Venezuela.

Drilling for oil is basically the process of making "decisions under uncertainty." There's an oil game that demonstrates this, too.

It's called "Gusher," but is not to be confused with the parlor game of the same name, or with "Wildcat," a game developed by E. I. du Pont de Nemours & Co., for public relations purposes.

Gusher "is a mechanical model or simulation of a potentially productive oil and gas area," says its creator, C. Jackson Grayson, Jr., associate professor at Tulane University.

The rules of the game are these: A player is confronted with a box 42 x 42 x 4 in. The top of the box (and corresponding layers inside) have been pierced with 1,000 holes representing potential wells.

To drill a well, a player simply drops a brass peg, long or short, depending upon the desired depth, into a selected hole. If the peg sinks out of sight, the hole is "dry." But if it hits a template inside the box, the player has found oil—or gas.

Although the game is outwardly simple, it can help producers discover a near-optimum way to explore for oil, says Grayson.

By placing templates in carefully selected spots in the box, Grayson can duplicate geological conditions in actual oil fields.

And by introducing an array of cost factors (for leasing, surveys, drilling), Grayson forces his players to sift through various drilling strategies in a realistic manner.

Eventually, Grayson intends to apply the game to computer operation.

A game that gives marketing executives an opportunity to experiment with service stations has been developed by Imperial Oil Ltd.

In this game, five players representing competing neighborhood dealers sit before individual units of a special-purpose computer, called ASCOT (for Analogue Simulator of Competitive Operation Tactics).

By manipulating dials on their ASCOT sets, the players can switch prices, wages, hours, advertising expenditure, and the "quality" of their service—they can introduce tow truck service, for example—in accordance with realistic rules.

They can also keep tabs on each other by spending $100 of their budget for a market survey. But they're prevented from overhearing each other's plans by sound effects, which also imbue the game with some "real life" service station atmosphere.

Periodically, the players get "radio" announcements about traffic diversions or construction projects, which force them to make changes in their competitive tactics.

As each player dials his moves into the game at will, ASCOT compares them with its own programmed experience and reveals how each player is individually affected (how far his cash reserves have fallen, for example).

A similar service station game is being developed by a leading marketing company in this country.

Each week, during a seven-week course, service station trainees, located in more than 30 training centers, submit their "moves" (change prices, wages, hours).

The moves are teletyped to a centrally located IBM 7090, and in a matter of a few hours the results are teletyped back to the trainees for review.

Decision-Making Tool Was Created in 1957

Business "war games"—as they were first called—began almost four years ago at the American Management Assn.

Twenty company presidents gathered at AMA headquarters in New York, divided themselves into five teams, and played out several years of business competition in a few hours.

Since then AMA has developed seven different basic games for all phases of business from marketing to manufacturing.

Individual companies and universities have developed almost 100 other games, most of them in the past year.

Oil companies had been slow to consider these new training aids, but they are now beginning to recognize that games can provide the practical complement to the traditional methods of training. There are several factors that explain the sluggish acceptance of games, experts say.

At first, the games (which are often played on computers) handed training executives the psychologically shocking thought of being replaced by machines.

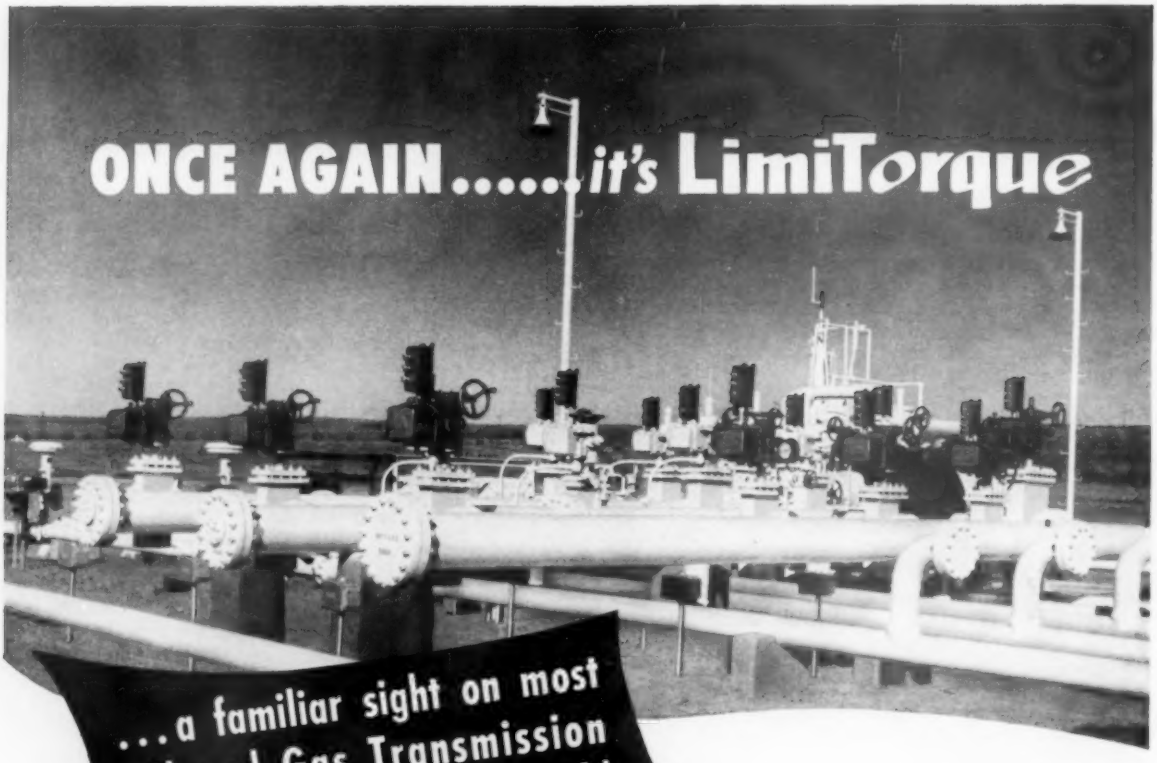
Then, too, the word "game" is unfortunate. It contains too many misleading connotations.

There are, of course, justified criticisms of games. Some educators hold, for example, that the reactions that games instill in their players have not been clearly understood.

A too hasty introduction of games could be something like rushing into a Link trainer that teaches pilots to land short of the runway, they warn.

As an understanding of games—or business exercises—grows in the industry, more and more companies are turning to them.

Almost a dozen games already have been designed for the industry (some of which are described here).



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Is 'New' Canada-U.S. LPG Line Needed?

Interprovincial Pipe Line Co. has disclosed that last fall it batched 100,000 bbl. of LPG through its crude system to the U.S. to show that Canada's surplus gas liquids should be moved to Midwest markets through an existing pipeline.

Of the 100,000 bbl., 70,000 bbl. were delivered to Bay City, Mich., and 30,000 bbl. were taken on to Sarnia, Ont.

Interprovincial has two parallel crude lines from Edmonton to Superior, Wis. From Superior to Sarnia there is a single line, which is operated by Lakehead Pipe Line Co., a division of Interprovincial.

The surprise disclosure was made as the Alberta Oil & Gas Conservation Board reopened hearings on revised plans of Westalta Products Pipe Line, Ltd., and Foothills Pipe Lines, Ltd., which want to build a new line to Chicago.

While the two companies have modified their original proposal somewhat, they still eventually want to build the 1,244-mi. gathering and trunk system from the Alberta Foothills to the U.S. Midwest (PW—Oct. 21'60,p86).

The two companies, together with Pembina Pipe Line, Ltd., their parent company, have reached an agreement with Standard Oil Co. (Ind.) to develop the system.

They told PETROLEUM WEEK they "are prepared to use these facilities of Interprovincial . . . to look after the immediate problem of producers. . . ."

However, the two pipeline firms made it clear that they feel that their proposed new system would be the most economical way to move LPG to Chicago, when volumes are produced in surplus of provincial needs.

In announcing its willingness to use Interprovincial's facilities during the early stages of production, Westalta—which would build the gathering portion of the system—also withdrew a request for permission to deliver liquids to the Glacier Pipe Line System (PW—Jan.6'61,p39).

Interprovincial contends that its system would provide the most economical means—and also has sufficient capacity—to transport the LPG that will be required in the Midwest.

"The Interprovincial system today has adequate reserve capacity, and is sufficiently flexible, to provide transportation to the mid-central U.S. and Eastern Canada markets," the company told the board.

The company says that it could convert one of its two crude lines to Superior entirely to LPG service, as the volume increases.

Total capacity of the dual lines is expected to reach 328,500 b/d when the company completes a pump-station building program this year.

Interprovincial plans to transship the gas liquids to the Chicago area through existing connections for the time being—but proposes to build a 400-mi. extension from Superior when needed. The proposed extension would be 10¾ in. in diameter, and would cost about $20-million.

The company doesn't say specifically what existing lines it intends to use if its plans are approved. But presumably it plans to ship the LPG into Michigan through the Lakehead line, and then on to Chicago by using the many small-diameter crude lines that criss-cross Michigan.

Interprovincial now moves crude through a connection at Clearbrook, Minn., into the pipeline of Minnesota Pipe Line Co., which carries it to Minneapolis.

Interprovincial proposes to deliver at least 50,000 b/d of LPG to the Midwest. By 1962 an estimated 42,000 b/d of gas liquids will be available for export, with available volumes reaching 50,000 b/d by 1963.

Interprovincial has already set an Edmonton-to-Chicago tariff: 55¢ per bbl. for shipments at the rate of 20,000 b/d, and less than 40¢ for batches of 50,000 b/d or more.

Improved Telemetering Sought

Existing telemetering equipment must be refined—and new instruments developed—to meet the increasing demands of the pipeline industry for more accurate and fuller control, according to I. B. Cloessner, Jr., Humble Pipe Line Co.

Cloessner told a recent meeting of the American Institute of Electrical Engineers, in New York, that great headway had been made in developing telemetering equipment for the pipeline industry.

"As a result," he added, "the pipeline industry leans heavily on telemetering. Tomorrow, telemetering will be called on to carry an even heavier burden."

There's room for improvement in several specific areas of telemetering, according to Cloessner.

- Greater standardization among manufacturers with regard to transducer output signals or digital codes.
- Production of equipment that will calibrate easier and hold calibration better than some in use.
- Efforts to increase the ability of apparatus to withstand field use better and thereby reduce maintenance costs, which can be a big item, since installations often are at remote locations.
- More detail in instruction books—some of which, Cloessner says, are "inadequate."

Cloessner adds that, in the future, different telemetering instruments will be required "to aid in solving new problems." To develop them, he calls for "joint efforts among the pipeline, instrumentation, and telemetering industries. . ."

Telemetering may help close the loop to computer control.

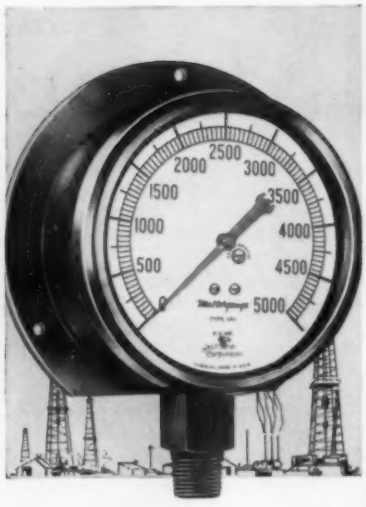
Cloessner predicts that automation could evolve to the point where "a multitude of systems" might be controlled from only a few central locations.

Supervisory control—and possibly automatic control—of crude gathering systems will become a reality, the Humble pipeline man asserts.

Before either kind of control system comes into existence, however, telemetering equipment to measure basic sediment and water (BS&W) and gravity "will have to be considerably improved," he asserts.

Use of digital telemetering equipment—which lends itself readily to automatic data logging and computer operation—may pick up with the introduction of solid-state devices, Cloessner feels.

If reliable solid-state electronic equipment that doesn't require maintenance can be developed economically, he predicts, digital telemetering probably will come into wide use.



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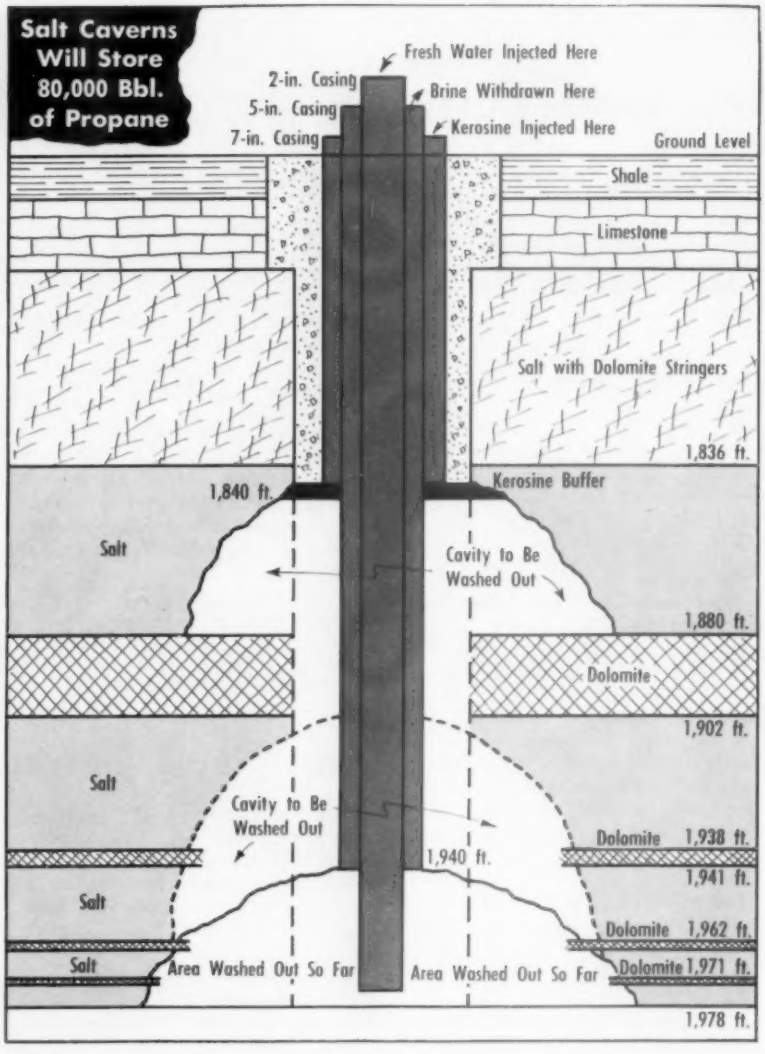


Washing Out Salt Dome Ticklish

Sohio Pipe Line Co. is encountering—and apparently solving—some tricky problems in developing two caverns for propane storage in a salt formation in Cleveland.

The underground wells—which will have a total capacity of 80,000 bbl.—are being washed out of a salt bed at the No. 1 refinery of Standard Oil Co. (Ohio), where propane has become available in marketable quantities as a result of rescheduling product runs.

The caverns will be situated above and below a 22-ft. stratum of dolomite in salt laced with stringers and thin layers of dolomite, which have been the chief cause of worry.

Salt with a few layers of dolomite occurs at a depth of 1,836 ft. to 1,978 ft. Above 1,836 ft. is a stratum of salt and dolomite stringers, topped by limestone, then shale.

Sohio was afraid that, as it washed out the first cavity—below the thick dolomite layer—another 6-in. layer at 1,971 ft. would break off and snap a 2-in. water-injection pipe. But the pipe is intact, though the dolomite may have collapsed.

As of last week, the company had been successful in washing out the cavern from its floor to a depth of 1,940 ft. without any mishaps.

Presumably, however, it still had to be concerned about the possible pinching off of the casing by two other layers of dolomite—at 1,962 ft. and 1,938 ft.—which it would reach as it continued to dissolve the salt to the 1,902-ft. level.

The caverns are being formed by injecting fresh water through the 2-in.

tubing and then removing the brine through a 5-in. casing. When the washing out began in the fall, brine was being pumped out at a rate of less than 100 b/d, which has now been increased to 400 b/d.

Sohio expects to start work soon on the upper cavern, where it will face the difficulty of preventing the salt in the roof from being washed out and the dolomite from falling.

The roof is flat, so that there is a limit to how much it can be undercut before it falls, according to the company. On the basis of calculations involving the weight, depth, and density of the formations above the roof, Sohio engineers calculate, the dolomite would fall if the salt were washed out and left unsupported for a span of 50 ft. to 60 ft.

Kerosine has been pumped through a 7-in. casing to act as a buffer between the roof and brine.

Sohio explains that the kerosine will float on top of the brine. In addition to preventing dissolution of the salt, the company points out, the layer of kerosine will act to give the ceiling a dome contour as the well is washed out and thereby increase its structural strength.

Before proceeding with the second cavity, the 2-in. tubing will be removed. The 5-in. casing will then be perforated at a point 1,850 ft. down its length, and the 2-in. pipe reinserted. The perforations will be 10 ft. lower than the bottom of the 7-in. casing.

The brine will escape through these holes.

What's New / IN TRANSPORTATION

Continental Pipe Line Co. wants to build a gathering system in the Bertha and Prairie Creek fields, in Wyoming, together with a pipeline to move the crude out.

The 18-mi., 4-in. line would connect the gathering network with the Miller Creek station of Belle Fourche Pipeline Co.

Wyoming's Public Service Commission will hold a hearing on the plan on Thursday.

•

Canadian Husky Oil, Ltd., reportedly plans to buy all—or substantially all—of the assets of Merit Oil Corp., majority owner of Provincial Products Pipelines, Ltd.

It is also reported, however, that Husky hasn't decided whether it will pursue Provincial's application to the Alberta Oil & Gas Conservation Board to build a gas liquids gathering system in the province (PW—Oct.21'60, p86).

•

Michigan Wisconsin Pipe Line Co. will seek Federal Power Commission authority to spend $5.9-million for a pipeline to take gas from Oklahoma's Woodward area.

The 62-mi. line will tie in with the company's main system in Kiowa County, Kan.

•

The Interstate Commerce Commission has ordered a probe into collisions involving trains with trucks hauling petroleum, chemicals, and explosives.

ICC hopes to determine if new safety regulations are needed.

The investigation was requested by five rail labor organizations, who earlier had been turned down.

•

Lone Star Gas Co. will build a 5.6-mi. pipeline to provide an outlet for East Texas' Danville Field, located in Rusk and Gregg Counties.

The company has also announced plans to install 14.5 mi. of line in Carter County, Okla., to pick up gas from a Pure Oil Co. natural gasoline plant in the Caddo Field, near Glenn.

•

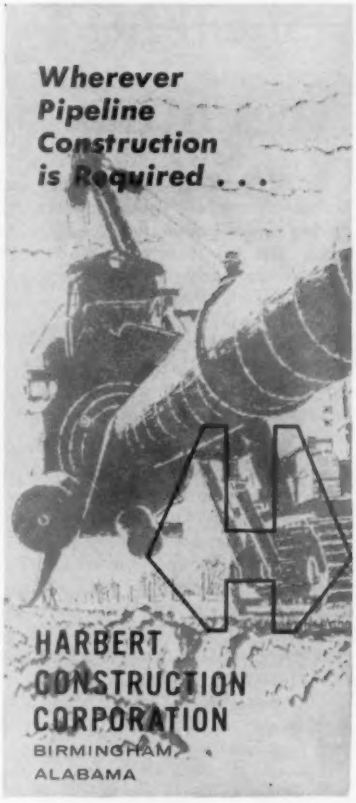
Size of the world's tanker fleet is now at 66.9-million tons, according to Davies & Newman, ship and oil brokerage firm.

Last year, 162 tankers were launched, representing a total tonnage of 5.65-million.

Tankers totaling nearly 2.7-million tons went to breakers last year.

A significant sidelight of last year's tanker picture is that the Greek fleet picked up 500,000 tons, while the Liberian fleet dropped 354,000 tons.

It was also noted that 48% of existing tonnage was built in the years 1956-60.



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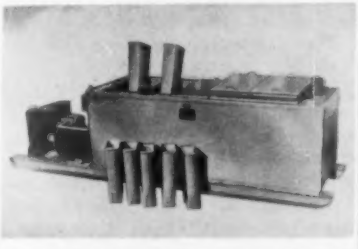

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Argentina Starts Crude Export Sales

BUENOS AIRES—Both politics and economics are seen in Argentina's surprising appearance last week as a crude exporter ready to move into competitive world markets for the first time (PW—Feb.10'61,p6).

Argentina has no crude surplus yet, though it expects to export some products in the near future. In fact, it is still importing crude as well as products, though in diminishing volume as its own production climbs.

Its first customer will be neighboring Uruguay—a market hitherto supplied largely by U.S. firms with production in Venezuela.

An agreement for delivery of 4.4-million bbl. in 1961-63 has already been reached by the two state oil agencies, Argentina's YPF and Uruguay's Ancap, Argentina's Fuel & Power Secretary announced last week.

The sales reportedly will be payable in U.S. dollars. The oil will be delivered from southern Argentina.

Though the volume is not large—an average of roughly 4,000 b/d for the three years—the deal means that Argentina has sewed up 25% of one crude market abroad even before closing its own doors to oil imports.

Politically, Argentina's announcement of the planned exports to Uruguay supports the government's assurances that the country is well on the road to self-sufficiency in oil.

This has been a prime goal of the Frondizi government, which has been having its political difficulties of late. Among them: recurring outbursts of nationalistic criticism of its policy, implemented in 1958, of bringing in foreign oil capital to speed the job.

Argentina has, in fact, taken giant strides toward its oil goal since 1958, with hopes now that self-sufficiency can be reached by mid-year if the present growth rate can be maintained.

Final figures for 1960 have not been released yet, but 11-month statistics show that crude production in that period climbed 40% to 170,552 b/d, from 121,454 b/d for the same period of 1959. It was climbing sharply toward year's end, with November output averaging 222,333 b/d, a 75% jump over November, 1959.

Oil imports, including products, dropped 30% in the 11-month period to 103,100 b/d, from 150,000 b/d in 1959.

An economic advantage in the crude sale to Uruguay is that the oil will bring in approximately $10-million, in U.S. dollars.

This would relieve Argentina's financial pressures, since YPF badly needs foreign exchange to pay the U.S. oil companies and contractors who are developing production for its account.

It is further suggested that export of the southern crude may look financially more attractive at present than delivery to Argentina's own consuming areas, due to transport costs.

The oil will be exported from two southern areas—one of them under development by Tennessee Gas Transmission Co. This area is in the Argentine half of Tierra del Fuego, the island at the extreme tip of South America from which the first delivery to Uruguay will be made Feb. 19.

The other is Canadon Seco, which YPF itself is developing on the mainland in Santa Cruz province, in the Comodoro Rivadavia area. (It is south of a tract held under contract by Pan American International.)

TGT is operating in Tierra del Fuego under a contract signed with YPF in 1959 (PW—May 15'59,p 164). TGT bears exploratory risks, against payment for oil produced and delivered to YPF. After free delivery of 504,000 bbl. in return for use of existing facilities, TGT will get approximately $1.77 per bbl., adjusted to world market prices.

The first cargo of TGT production —nearly 100,000 b/d of 41.8-gravity

Venezuela's State Firm Slates

CARACAS—Venezuela's national oil company expects to have a platform completed for drilling its first test in Lake Maracaibo within two months or so.

The plan marks the first step toward a possible target of 10,000 b/d of crude production within a year—a goal which the Oil Minister says the recently activated Venezuelan Petroleum Corp. may set (PW—Feb. 10'61,p41).

Construction companies have been invited by VPC to submit preliminary qualifying data in preparation for bidding on the well platform.

The location for the 13,000-ft. lake test will be an area offsetting production on the Phillips Petroleum group's Block 17 and Shell's Block V.

The site is in the mid-lake corner of the bottom leg of the 332,800-acre L-shaped tract assigned to VPC in the lake. It also holds 16,600 acres in eastern Venezuela.

The lake test will probably be drilled by a contractor, according to general director Carlos Rojas Davila.

Maracaibo field operations will be headed by Gorgias Garriga, former director of geology in the Oil Ministry.

Present marketability of the type of crude likely to be found in a given area will be taken into account in selection of a site for a second test elsewhere in Venezuela, Rojas Davila says.

An exploratory group being set up under Jose Luis Padron, a member of VPC's executive committee, will probably select the site for this test.

Plans for intensive exploration of open acreage contemplate stratigraphic tests as well as geological and geophysical exploration.

The company, Rojas Davila emphasizes, intends to operate "completely independent of political influence and strictly on a commercial basis."

He adds that it "will make use of all the possibilities of negotiation represented by service contracts" with private firms.

That, he explains, can mean arrangements for marketing as well as for exploration and development.

The firm is starting up in business with cash appropriations totaling $2¼-million, and its 349,000 acres of choice development parcels in the lake and eastern Venezuela.

The company, created by presidential decree in April, 1960, was set in motion in December, when Oil Minister Juan Perez Alfonzo appointed its board of directors (PW—Jan.6 '61,p40). The Oil Minister is chairman of the board.

Currently, it is putting together a nucleus technical staff.

Advertisements that appeared in

crude—was delivered to YPF's refinery at Buenos Aires last summer (PW—Sep.2'60,p13).

Uruguay asked for extended payment terms and competitive prices for the Argentine crude.

Payment in U.S. dollars is to be made 50% within 180 days of delivery, and the rest within 360 days.

According to unofficial reports, Uruguay has offered to pay f.o.b. prices of $1.74 per barrel for 26-29-gravity crude and $2.30 for 40-49-gravity (two ranges which YPF is apparently prepared to deliver). There was no immediate disclosure of final prices agreed upon in negotiations in Montevideo during the week.

Uruguay's Ancap has also had offers of crude from Venezuela, the Middle East, the French Sahara, and the Soviet Union for its 1961-63 supplies. It published previous bids three times in past months, but again postponed full awards last week, though awarding another partial contract to Gulf Oil for Kuwait crude.

First Test

Caracas newspapers most recently did not specify—as before—that applicants must be Venezuelans.

Personnel will be selected from any source, though VPC will remain within the legal limit of not more than 25% foreign technical employees.

VPC plans to hire one engineer with reservoir experience, another experienced in drilling, and a third with general qualifications.

Two geologists and one geophysicist with good knowledge of Venezuelan geology are also sought.

Actual operations are in charge of a four-member executive committee headed by Rojas Davila.

In addition to his position as general director, Rojas Davila will also take charge of VPC's sales department until a sales manager with broad market knowledge can be found.

Operating departments are headed by the other three executive committee members:

Exploration: Jose Luis Padron, a former Mene Grande Oil Co. geologist who later served as reservoir geologist in the Oil Ministry;

Development: J. A. Gil Yepez, a Tulsa University graduate who formerly headed the same department in the Oil Ministry; and

Administration: Angel Feliz Bravo, another one-time Creole employe and a former director of Fedepetrol.

Spur for East Africa Oil Hunt?

Sinclair's report of oil shows in Somalia is the first encouraging news to come from East Africa—once a relatively high-hopes area—in many months.

The oil was encountered 50 mi. west of Mogadiscio in the No. 1 Cariole wildcat—but not in commercial quantities, Sinclair confirmed (PW—Feb.10'61,p40).

Further tests may be made, but meanwhile, the wildcat is being deepened, the company said.

The test is the sixth drilled in Somalia by Sinclair Somal, operator on a 42-million-acre concession in which Sinclair Oil holds a 50% interest. The other 50% is shared equally by the Conorada group of companies.

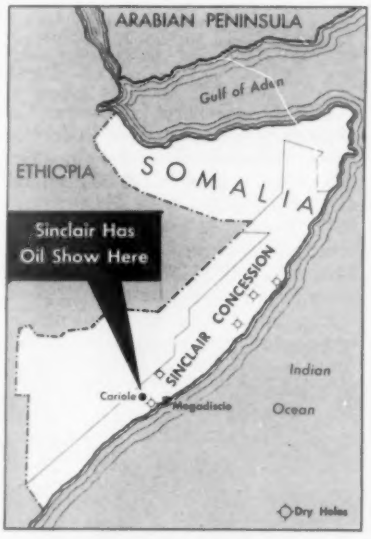
Exploration in East Africa, once moving ahead at a steady pace, has slowed to a stroll:

- **Somalia** (including the former British Somaliland)—Stanvac, after drilling five wildcats, is now conducting only surface geology.

British Petroleum, also active in Somalia at one time, is reported not active now.

Also, there are no reports that either of the other two companies with rights in Somalia, the Italian state firm ENI or the Canadian Company, Forbisher, are at present drilling or planning to drill.

- **Kenya**—BP-Shell is drilling a third deep stratigraphic test, and also has a seismic crew in the field.
- **Tanganyika**—BP-Shell, the only concession holder, is not now active. In 1959, the firm drilled four holes, all without result.



- **Mozambique**—Gulf, in partnership with Pan American, is conducting seismic surveys. No drilling is planned in the near future. Gulf has previously drilled five dry holes.
- **Sudan**—General Exploration Co. of California has done some geophysical and aerial work. It says it has not budgeted money for 1961 drilling.
- **Ethiopia**—Gewerkschaft Elwerath, of Germany, is reportedly concentrating on surface geology. The company acquired its rights after Sinclair pulled out four years ago.

Venezuela Sets Pay-As-You-Go

CARACAS—Venezuela is putting oil companies on a pay-as-you-go income tax basis under a new income tax reform law.

Oil as well as mining companies will be required to submit an estimate of their annual income within the first quarter of each year. They will pay the corresponding taxes in four installments, within 15 days after the end of each quarter.

The law is due to be published in the Official Gazette this week.

Oil companies could be required to make income tax payments of close to $400-million one year earlier than expected.

The new legislation, however, specifies that the government may stretch out tax payments for the first year under the new system over a period as long as three years.

Moving oil company income tax payments ahead will help overcome the government's current budget deficit of $540-million.

Royalty payments also were recently moved a month ahead, and placed on a twice-monthly basis. Further, oil companies will pay the third instalment on 1960 income taxes in June this year, instead of August. They are also guaranteeing a $75-million short-term loan from New York banks, to be repaid within the fiscal year ending in June.

The income tax reform law as passed eliminates all tax relief measures proposed for oil companies in the government's original draft bill last September. Those included tax reductions for exploratory investment and a 1% allowable deduction for sales expenditures abroad.

What's New / AROUND THE WORLD

BURMA—General Exploration Co. of California has extended its foreign exploration interests to Burma, where it has been granted 10,000 sq. mi. in the Irrawaddy Basin. The acreage is the first issued to a foreign oil firm other than Burma Oil Co. (1954), Ltd., which is 51% owned by the government.

The Los Angeles independent also holds a 50% interest in over 3-million acres in Australia, on which the first test has just been spudded (PW—Feb.10'61,p41). It also has a license on 2,000 sq. mi. along Sudan's Red Sea coast.

•

VENEZUELA—Net profits of oil companies in Venezuela dropped 9% in 1960 to an estimated $390-million, from $427-million in 1959, according to an official estimate cited by Venezuela's Oil Industry Chamber.

Noting official statements that government income from oil also declined, the Chamber expects the government-industry profit-split ratio for 1960 will be 69-31, same as for 1959 (PW—Aug.8'60,p37).

•

VENEZUELA — Creole Petroleum, the first company to give up Lake Maracaibo acreage in years, has turned back another 65,000 acres. The concessions are north and west of Cabimas, adjoining 46,000 acres turned back last summer. Creole has also just relinquished parcels near the Mara field, and offshore in the lake narrows east of Mara.

•

ARGENTINA—Foreign companies may eventually get a chance to bid for new oil rights offered last week on the south flank of the Comodoro Rivadavia Basin—but only if there are no acceptable bids from Argentine firms backed by Argentine capital.

This limited new call for tenders, by Apr. 27, covers development of only two 11½ sq. mi. areas, in the El Huemul zone, Santa Cruz province, 14 mi. northeast of Pico Truncado. Each has one producing well.

Bids must be accompanied by a 1-million-peso deposit ($10,000 at the free rate). Contracts will be granted for a maximum of 20 years, with payment in pesos for oil produced and delivered at Pico Truncado to YPF, the state oil agency.

•

COLOMBIA—Mobil has increased from 65% to 80% its holdings in a fast-growing local marketing firm, CODI, which was formed in 1955 and now holds 20% of the Colombian market for refined products. One result of the increase in Mobil's share in Codi will be expanded sales of its crude, the company says.

•

EGYPT—Offshore exploration is slated in the Gulf of Suez by the state-owned General Petroleum Co., as well as by COPE, the mixed-venture producing company that is getting set for offshore drilling from a mobile platform (PW—Feb.10'61,p41).

GPC's capital is being doubled to $17.3-million to permit undertaking offshore work, officials announced. The company holds 63 permits, mostly along both shores of the Gulf. So far, it has developed some production in small fields on the west coast.

•

SYRIA—Three Russian rigs are being moved into the Karachok field in northeast Syria, where a sixth producer has been brought in at a reported flowing rate of 4,000 b/d.

The rigs, capable of drilling to 13,000 ft., were delivered under a Soviet-Syrian economic aid pact. Drilling at Karachok is currently being done by the General Petroleum Authority, which took over the field after Syria cancelled the Menhall-Atlantic Refining rights.

•

ENGLAND—The Scandinavian market—in which new refining capacity is slated—was the biggest export outlet for refiners in Britain last year. According to the Petroleum Information Bureau, London, total products exports were 8.7-million long tons, bringing in a record $291.4-million. Sales to Scandinavian countries accounted for $134.4-million. West Germany and the Benelux

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countries, other main customers, took nearly $45-million worth.

•

AUSTRALIA—The British-owned Burmah Oil Co. has acquired an interest in offshore exploration rights held by Australian Pacific Oil Co. The acreage, south of Adelaide, includes part of Kangaroo Island and extends to the Victoria state border. Only preliminary surveys are planned, now, according to BOC.

•

RHODESIA—The question of a refinery in Southern Rhodesia is still up in the air, with no decision yet on the proposal backed by American Independent Oil Co. The government announced a further extension of the deadline given R. S. Steinbock to present a firm plan, reportedly because Aminoil felt more time was needed to work it out.

Meanwhile, it will also consider a report by British consultants hired to assess the economic advisability of a refinery in the country.

•

EGYPT—President Nasser's decision on long-pending bids for new oil rights in the Western Desert is expected by the end of February, according to indications given in Cairo. Proposals from foreign oil companies have been processed, with those approved awaiting disposition by the president.

Several companies reportedly made offers, but there is still no reliable information on which of them have actually been in the running.

•

BRAZIL—Appointment of a geologist as head of Petrobras has been blocked—reportedly by military opposition to any civilian as chief of the state oil development monopoly. The post has always been held by military men. It remains unfilled this week with failure of Brazil's new president to follow through with his planned appointment of geologist Geonisio Barroso (PW—Feb.10'61,p40).

•

INDIA—The government expects to sign its first new oil exploration agreement with a private foreign company in March, according to Oil Ministry Secretary K. K. Sahni.

The disclosure follows criticism, at home and abroad, of the government's "procrastinations" in reaching any agreements under its revised oil rules. The Oil Ministry's contention is that even in making detailed offers, companies overlooked basic requirements the government made clear in advance: "reasonable" government participation; no prior refining-marketing commitment; and no 50-50 profit-sharing formula as a precondition.

•

TURKEY—Mobil will soon put a second rig in operation in the vicinity of its Bulgurdag discovery in south-central Turkey (PW—Jul.29'60,p40). The company has moved in its own rig from the U.S.

Mobil's drilling contractor, Drilling Co. of Turkey S.A., operates the other rig.

•

LIBYA—Shell has stacked one of its Libyan rigs in Tripoli after abandoning its first wildcat on Block 39, which is along the Mediterranean coast in eastern Libya.

The company has two other rigs working at present, both of them in Block 41, in the Benghazi area.

...in difficult areas

On the surface, tellurometers accurate to within inches over a fifty-mile traverse are visible indicators of GSI's new look at refraction shooting.

Looking deeper, recently developed refraction interpretation techniques, special refraction instruments and seismometers are giving GSI clients subsurface data in areas where it was unobtainable in the past.

If you have prospects which refuse to yield deep data through the use of reflection shooting our new look at refraction will interest you.

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GEOPHYSICAL SERVICE INC.
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A TEXAS INSTRUMENTS COMPANY

DIGGING for fill boxes: Just one time-consuming task.

PLODDING knee-deep in snow: A Mobil driver in Long Island.

Paralyzing Snowfall Puts a Red Blot

This should have been the best winter within memory for fuel oil distributors in the East. But a crippling snow storm last week turned profits into losses for many of them.

Just before the huge storm that blanketed half the country—from Iowa to the Atlantic—with a foot or more of snow, dealers were counting degree days with enthusiasm.

The mammoth metropolitan New York market had so many consecutive days of freezing temperatures that weathermen had to look back beyond 1881 for records that hadn't yet been broken.

Home owners—especially those in poorly insulated dwellings—were burning oil twice as fast as normally. In some areas, tanks had to be filled every two weeks, instead of every four.

But the actual task of getting out the oil during the snow blockade was a very costly affair.

Every fuel oil truck had to be manned with two men, instead of one, thus inflating labor costs that had already become bloated with overtime.

Some drivers were snowbound for 14 hours, and collected overtime pay for every minute.

Even in Buffalo—where distributors are accustomed to snowfalls—one company sent five tank trucks to a refinery across town and heard from only one all day. The rest got stuck on the highway.

Some drivers spent hours shoveling down through ten-foot drifts in search of fill boxes, despite the warnings of oil heat associations that home owners who wanted deliveries had better uncover the boxes themselves.

Harbors froze over around Long Island. Distributors and major companies alike had to hire emergency tugs to cut a path to their terminals, further adding to the cost of delivery.

One distributor on Long Island drove his own tractor through town, clearing a path for his trucks—at $35 an hour.

All across the Eastern half of the country, suppliers were forced to scramble for secondary sources of products. The inland waterways, from St. Louis eastward, had become badly clogged with ice.

Some barge shipments were marooned for two weeks in a foot of ice on the Hudson River.

Perhaps the most unfortunate story to come out of the storm involved a forecasting service hired by a major oil company. The service had warned of a warmer-than-normal winter this year.

Even without the snow storm, distributors had begun to realize that the 1960-61 heating season was not as profitable as it had at first appeared.

By last week, degree days in New York had reached 3,209 since the beginning of September. Last season they were 2,857 over the same period.

But for oil men who looked beneath the surface significance of this comparison, it became obvious that the degree days had lost some of their meaning.

When temperatures in a single day fall below a certain point they lose their linear relationship with fuel oil demand. Degree days may continue to soar beyond this point, but demand increases much less rapidly.

One reason for this is that home owners tend to keep their houses warm all night during freezing spells, thus avoiding the inefficient warm-up period each morning.

There is another cost factor connected with the storm that may never be fully recovered: the loss of public confidence.

The problem stems mainly from the widely publicized increase in fuel

TWO DRIVERS per truck inflate costs.

TRUCKS were snowbound for hours.

RESCUE operations were costly: Giffords, Inc., had three trucks trapped in New York.

on Winter's Ledger

oil prices that were invoked on the very first day of the storm. These price increases were kept before the public by newspaper reports and caused many consumers to run to their phones to demand fuel oil deliveries "before the price increase reaches me." One distributor received 20 such calls in a single day last week.

"If it hadn't been for this price rise," said Len Braun, president of Oil Heat Institute of Long Island, "we would have been considered martyrs. Now it looks as though we took advantage of the storm to gouge the consumer."

The storm also uncorked a simmering promotion battle between oil distributors in the New York area and gas utilities.

This battle had reached fever pitch last year (PW—Dec.4'59,p59) and threatened to scorch public advertising again this year.

The Better Business Bureau, partly on its own initiative, stepped in last November as a sort of referee and has tried ever since to get both sides to agree on a set of standards that could be adopted.

The bureau is fearful that unless the negative and critical aspects of home-heating ads can be corrected, they may provoke legislative restrictions from Washington.

It is planning a meeting for the two sides sometime this month.

Just before the storm, and again last week, a gas utility in the New York area ran what the bureau considers derogatory advertising. The ads infuriated fuel oil dealers who were (they claim) recognizing a sort of moratorium on such promotion.

The gas advertisements prodded fuel oil customers with "Are you fed up?"

"Are you suffering this winter from constant irritating heating breakdowns?" the ads probed. "Leaky tank? Sky-high repair bills? Insufficient heat? Worry about fuel deliveries?"

Finally the utility urged: "Yank that [fuel oil] tank."

The storm had made fuel oil dealers easy targets for such attacks, said Braun, but the price rise has made their position even more vulnerable.

The problem seemed to lend bitter emphasis to a sentiment that is now becoming common among dealers in many communities in the East: "We would have preferred a normal winter."

What's New
IN MARKETING

How does a major oil company test a service station pump island before using it? Mobil Oil Co. has built a mock station in a warehouse to provide the answer.

Located in Carlstadt, N.J., the station serves as a "test tube" for two Mobil marketing teams. One plans a year ahead, the other looks five years into the future. Both groups test their ideas at the station, officially called the Test Design Center.

The center "speeds decisions," says Mobil's retail merchandising manager, B. W. Hurst. "Managers see first-hand and at one place what they are being asked to approve, thus avoiding costly mistakes."

One novel idea Mobil managers will see at the center is a new dramatic, rectangular sign.

•

One oil tank to serve an entire development of homes: That's what the future holds in store, says R. M. Barr, sales manager for Jet Heet, Inc., Englewood, N.J.

Barr spoke last week before the Missouri Oil Jobbers Assn. in Kansas City. He said that the common tank would probably be owned by an oil marketer rather than by the home owners.

Fifteen years from now, Barr predicted, homes will be heated with fuel cells powered by heating oil.

•

The American motorist has 3.5-million miles of roads and streets to travel on, 88% of which are in rural communities, a new survey shows.

The data, released by the Dept. of Commerce, reveal that 29% of all U.S. roads are unsurfaced, but that the mileage of unsurfaced roads has been declining by 3% yearly.

•

By 1963, jet aircraft will have swept practically all the gasoline-powered planes from the world's commercial trunk airways, predicts General Dynamics Corp.

The company, which makes the Convair 880 jet transport, forecasts the world truck airlines will carry an annual total of 98-billion revenue passenger miles by 1963. Of these, 10% will be carried on piston-driven aircraft, 20% on turboprop (jet) aircraft and 70% on pure jets.

By our method of reporting unemployment...

We're Giving The United States A Black Eye That Is Not Deserved

The way in which our unemployment is reported is giving the United States an undeserved black eye around the world. The broad concept of unemployment we use exaggerates the amount of unemployment in the United States as compared to most other countries. Our reporting system also falls short of presenting a balanced picture by concentrating on people who are idle, while neglecting jobs that are idle because people cannot be found to fill them. This editorial explains these defects and suggests improvements.

The *Monthly Bulletin of Statistics,* issued by the Statistical Office of the United Nations, has become a standard reference for international comparisons of economic performance, including employment and unemployment. Here, from the November, 1960 issue, is part of a table giving comparative figures on the rate of unemployment for the United States and a group of European countries:

	UNEMPLOYMENT RATE	
	Annual Average 1959	Jan.-June Average 1960
West Germany	2.4%	1.0%
Netherlands	1.8	1.4
Sweden	2.0	1.8
United Kingdom	2.3	1.9
United States	5.5	6.1

A Distorted Picture

If taken at face value the table clearly says that the United States is doing far worse in providing jobs for its citizens than the other countries whose unemployment records are listed.

But the figures are deceptive. They are made so, in part, by our government's use of a much broader concept of what constitutes unemployment than is used by most other countries.

Sweden provides a clear case in point. The table indicates that during 1959 Sweden had an unemployment rate of 2.0%, while the rate in the

United States was 5.5%. But a report from Sweden, published in the U.S. Department of Labor's *Labor Developments Abroad*, indicates that if they had used the same methods of calculating unemployment as we, the reported jobless rate in Sweden would have almost doubled. Thus a large portion of the gap between the unemployment rate in the United States and the unemployment rate in Sweden would have been eliminated.

Graduation To Unemployment

In general, countries listed in the table use registrations at public employment agencies as the basis for calculating their unemployment. Our Department of Labor, in making its sampling of unemployment, includes unregistered young people who are waiting for jobs or training opportunities as well as housewives who are looking for jobs in a general sort of way but who have not registered anywhere in search of them.

It used to be that graduation from college was regarded as a day for great celebration and rejoicing. But, because of the way the Labor Department does its counting of unemployment, it is now a day of sorrow. For unless our young people immediately rush off to jobs, they graduate into unemployment and swell our jobless figures.

While our government very expansively counts all the unemployed, there is no offsetting report on the number of jobs that are unfilled because no one qualified can be found to fill them. Currently there are many jobs in this category, and it is to be expected that there will be more as the technological revolution picks up momentum.

A properly balanced report on unemployment would include a record both of people who are idle, as conceived on some standard international basis, and jobs that are idle. A combination of the two sets of data would provide a much better indication of the economic health of a nation than unemployment alone.

The United Kingdom regularly collects figures on unfilled jobs as well as the number of unemployed. Thus it is not an impossible task to collect information on idle jobs. **For a fast moving economy, such as ours, the collection of statistics on unfilled jobs presents special difficulties. But this information is so important that Congress should see that it is added to our employment and unemployment records.**

A National Disservice

There is not the slightest inclination here to minimize the amount of unemployment in the United States at any time, or the crucial importance of doing everything possible to keep it at rock bottom. If the reporting of unemployment were simply for domestic consumption, it would be possible to make an appealing case for using a very broad conception of it. This is one way of underlining the importance of the problem.

But when, as is the case, international comparisons of unemployment are treated as key gauges of the effectiveness of different economies, we do ourselves an important national disservice by using an exceptionally commodious concept of unemployment. American travelers abroad can testify that they are continuously being called upon to explain why the United States does such a relatively poor job in providing employment for its people. This is an unwise and unfair burden to impose upon the nation. **We make enough mistakes of economic commission and omission without issuing reports that distort our economic performance to our own discredit abroad.**

This message was prepared by my staff associates as part of our company-wide effort to report on major new developments in American business and industry. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or part of the text.

Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY

M. F. HAZEL has been elected executive vice-president of United States Steel Corp.'s Oil Well Supply Division, with headquarters in Dallas. **W. A. Weir, Jr.**, will succeed Hazel as vice-president, sales. Weir will move to Dallas from Calgary, where he has been manager of Oil Well's Canadian activities. **James E. Chenault, Jr.**, succeeds Weir as manager of the Canadian area. Chenault has been Oil Well's district manager in Edmonton. At the same time, **R. L. Armstrong** was named area manager for the company's Rocky Mountain area. He will be located at area headquarters, which recently moved from Casper, Wyo., to Denver. Armstrong was formerly a director of Oil Well Supply Co., Ltd., in London.

J. Hood

M. F. Hazel

J. (Tiger) HOOD has joined Tube Process Corp., Houston, as president. He was formerly assistant to the general manager of the Baroid Division, National Lead Co., in Houston, and was in charge of Baroid's new projects. Tube Process, founded in 1958, has a patented process for applying internal centrifugally cast lining to oilfield and industrial pipe to resist corrosion.

RICHARD V. WHITTY, JR., moves up to district manager of the Tulsa oilfield division office of Hagan Chemicals & Controls, Inc. The Tulsa office handles sales and services for the oilfield division, in Kansas and Oklahoma. Whitty joined Hagan as a sales engineer in 1956.

R. V. Whitty, Jr. A. T. Robertson

A. T. ROBERTSON moves up from personnel director to director of industrial relations for Magnet Cove Barium Corp., Houston, one of the Dresser Industries. In this newly created position, Robertson will be responsible for assisting Magcobar production plant and mine managers in areas of labor relations, personnel administration, and negotiations of work contracts with labor representatives. **Kenneth D. Reed** has been named to the newly created position of assistant director of industrial relations. He was formerly manager of employment and employee benefits for Magcobar.

LANSING M. HINRICHS has been promoted to general manager of Girdler Catalysts, a unit of the Louisville (Ky.) chemical products division of Chemetron Corp. Hinrichs, who joined the company in 1951, was patent counsel for the Girdler process equipment division in Louisville, before becoming assistant to the president of the chemical products division in 1959. He has been assistant general manager of catalyst operations for the past year.

JOE B. BYRD, who joined Cal-Metal Pipe Corp. of Louisiana, at the beginning of this year, has been named sales representative for the company at its Houston office. He has had sales experience with two other supply companies in the Houston area.

KENNETH F. WILLIAMSON has been named vice-president and product manager, valves, for Grove Valve & Regulator Co., in Oakland, Calif. He was formerly assistant sales manager for the company.

K. F. Williamson R. P. Klopp

RICHARD P. KLOPP moves up to general sales manager for Catalytic Construction Co., Philadelphia. Klopp, who has been with the company since 1952, was most recently manager of commercial sales. He has also had assignments in process and project engineering and in project management.

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PETROLEUM WEEK REPRESENTATIVES

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Trinity 5-0523

Boston 16 — David G. Sawyer
Copley Square
Congress 2-1160

Chicago 11 — Edward A. Callahan Jr.
520 N. Michigan Avenue
Mohawk 4-5800

Cleveland 15 — Marcus A. Loy, Jr.
55 Public Square
Superior 1-7000

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2100 Commerce Street
Riverside 7-9721

Denver 2 — J. W. Patten
Tower Bldg., 1700 Broadway
Alpine 5-2981

Houston 25 — D. O. Hanson
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Huntley 2-5450

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Oxford 5-5959

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Pittsburgh 22 — Marcus A. Loy, Jr.
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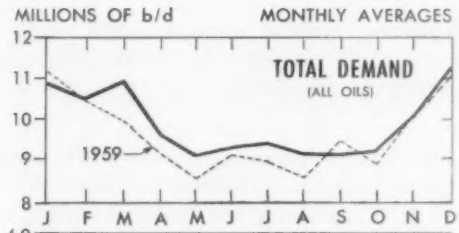
PETROLEUM WEEK'S

Fingertip Figures



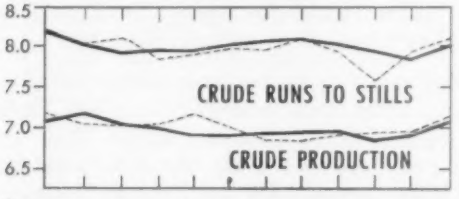
Figures for period ended Feb. 10, except as noted

TOTAL DEMAND

Latest 4-week average	*
Year ago	10.717

DISTILLATE DEMAND

Latest 4-week average	*
Year ago	3.149

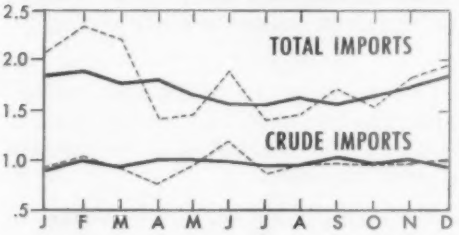


RUNS TO STILLS

Latest week	*
Previous week	8.297
Year ago	8.077

CRUDE PRODUCTION

Latest week	*
Previous week	7.137
Year ago	7.256

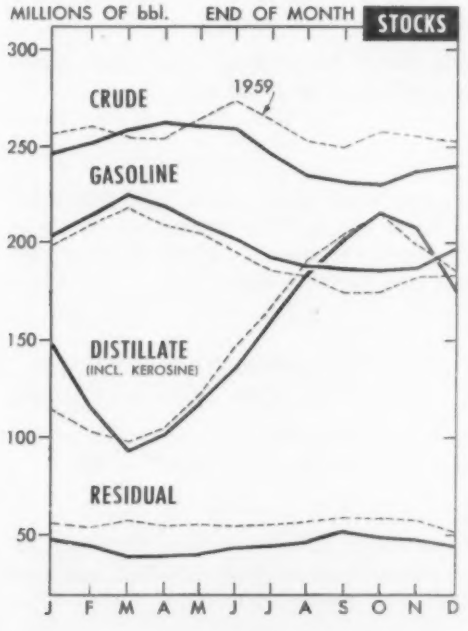


TOTAL IMPORTS

Latest week	*
Previous week	2.191
Year ago	1.615

CRUDE IMPORTS

Latest week	*
Previous week	.999
Year ago	.814



CRUDE STOCKS

Week-ended Feb. 4	233.2
Previous week	236.1
Year ago	249.4

GASOLINE

Latest week	*
Previous week	214.3
Year ago	208.9

DISTILLATES

Latest week	*
Previous week	132.7
Year ago	142.0

RESIDUAL

Latest week	*
Previous week	43.4
Year ago	48.0

Growth in demand for distillates will likely reach a "pivot" point by 1965. From then on, the rate of increase will slow up markedly.

Most of the loss will be due to the lag in the home heating market—by far the largest outlet for distillate fuels.

Demand for heating oil, which has met sharp competition from natural gas since the end of World War II, is expected to grow at a rate that will not exceed 2.6% for any single year between now and 1965. After that, the increase in demand is expected to slip back to approximately 2.0%, and then remain fairly steady.

Demand in 1970 may be running a slim 420,000 b/d higher than the anticipated 1961 rate of 1,900,000 b/d.

Demand for kerosine, excluding jet fuel, is expected to nosedive over the next decade.

The drop in the kerosine market will be due entirely to loss of space heating markets, particularly in the South.

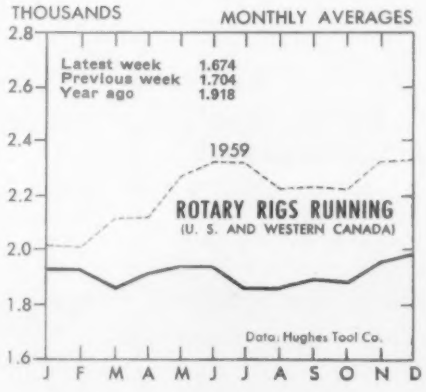
Demand will decrease at an estimated average rate of 4,000 b/d over the next several years, slipping below 200,000 b/d by 1970.

As the heating market for distillates dwindles, minor areas of demand will grow, softening the blow somewhat. The largest gain will be in fuel for diesel engines.

Industry sources figure the rate of increase in this category should be in the neighborhood of 7% per year.

* * *

*Due to the Lincoln's Birthday holiday, most figures for the week ended Feb. 10 were unavailable at press time.



The Market Trend

On Which Side of the Wall Do You Sit?

The U.S. this week, oilwise, is practically in a glass case. A severe winter has helped foster this isolation. So have import quotas.

In a world-wide business, the pros and cons of being in such a sequestered state are bound to get some airings started next Monday. That's when a new look-see by the Kennedy Administration will begin on the question of oil imports.

The contrasts between U.S. and foreign market conditions right now are quite marked. On the controversial subject of bunker "C" fuel, Gulf Coast markets are strong at $2.30 a bbl., and the Caribbean is ready to take on business at $1.70. In fact, traders feel that one seller asked for special favors at the Gulf when parting with two cargoes recently at the full price.

It's much the same story on distillates. The sale of over 40 cargoes of No. 2 at the Gulf since the cold weather set in has cleaned house on this market. On the other hand, if you had a "ticket" for finished products, you can pick up Caribbean No. 2 fuel and gas oil at a slight discount.

And the gap between U.S.-flag and foreign-flag spot tanker rates is probably at a record high. Clean spot rates in the protected Gulf-New York trade hit a post-Suez high last week of $4.96 a ton, or ATRS+73%. If Caribbean hauls to the U.S. were permitted on a scale, the rate would be more like $1.37, ATRS—50%. At least, that was the last clean fixture rate out of the Caribbean to Brazil, and idle clean tankers are still looking for business.

There are roughly 100 percentage points on the ATRS scale between spot U.S. and foreign black oil rates. The last-paid U.S.-flag rate, Gulf to New York, is $3.49 a ton, or ATRS+42½%. The last paid foreign rate, Aruba to New York, is $1.10 a ton, or ATRS—60%.

Translated to the realities of the market, U.S. vs. foreign bunker oil land in New York about $1 apart. For U.S. residual, it's about $2.92 a bbl. For foreign oil with a ticket, it's $1.92, not counting duty.

The analogy carries into crude prices, too. Politics aside, U.S. prices could rise. Skip politics again, and foreign prices could fall.

Gulf Wins A Crude Award:

Gulf won an award to supply Uruguay's oil agency with 1,010,000 cubic meters of crude over the next three years. This works out to about 6,700 b/d. Gulf's price for reconstituted Kuwait oil will be $2.05 a bbl., delivered, during 1961 and 1962, and $2.00 in 1963.

Shell to Supply BOAC With Fuels:

Shell got a big award last week, too. British Overseas Aircraft Co. gave the nod to Shell for the supply of fuels for a three- to five-year period.

The contract will begin on Apr. 1, and calls for 5.5-million bbl. in the first year. In the fifth year, the amount could reach 10-million bbl.

Ships Are Scarce:

The unusual situation of no spot offers of dirty vessels in the Gulf obtained last week. The rate hit a recent high of "plus 42½%," and then there just wasn't any rate at all. The reason: No ships.

The Market Place AROUND THE WORLD

Prices compiled for PETROLEUM WEEK by Platt's OILGRAM Price Service and National Petroleum News, McGraw-Hill Publications

All prices as of February 13

Bold face type indicates changes from previous week

KEY PRICES—REFINED PRODUCTS

(¢ per gal. except dollars per bbl. where $ is shown)

Western Hemisphere

U.S. Gulf Coast, cargoes
- Gasoline, 98 oct prem....12.25-13.25
- Gasoline, 92 oct reg....11.25-11-5
- Kerosine....10.25-10.75
- Heating oil, No. 2....9.5-10
- Gas oil, 48-52, d.i....9.75
- Fuel oil, bunker "C"....$2.30-2.40

Caribbean, cargoes
- Avgas, Grade 100/130....14.75
- Gasoline, 93 oct research prem....10.875
- Gasoline, 87 oct research reg....9.5
- Gasoline, 80 oct research....8.75
- Gasoline, 70-72 oct motor method....8.625
- Kerosine....9.875
- Heating oil, No. 2....8.625
- Gas oil, 48-52 d.i....8.875
- Fuel oil, bunker "C"....$2.00

New York Harbor, barges
- **Kerosine....11.65†-11.9†**
- **Heating oil, No. 2....10.65†-10.9†**
- Fuel oil, No. 6....$2.62

Okla.-Group 3, northern shpt., bulk
- Gasoline, 91 oct reg....12.5-13.25
- Kerosine....11-11.125
- Heating oil, No. 2....9.5-9.75
- Fuel oil, No. 6....$1.80-1.90

Chicago, bulk
- Gasoline, 92 oct reg....12.375-12.625
- Heating oil, No. 2....10.25-11.85
- Fuel oil, No. 6 high sulfur....7.65

Los Angeles, rack
- Gasoline, 88 oct reg....11.1-12.65
- Diesel fuel, PS 200....7.75-11.25
- Light fuel, PS 300....$2.90
- Heavy fuel, PS 400....$2.10-2.45

Natural Gasoline, Grade 26-70
- FOB Group 3....4.5
- FOB Breckenridge, Tex....4

LP-Gas
- Propane, Oklahoma (Group 3)....4.5-5
- Propane, Baton Rouge....5.875

Pennsylvania Lubes
- Bright stock, 25 p.t....26
- 200 vis. neutral, 25 p.t....28

Mid-Continent Lubes, Tulsa basis
- Bright stock, solvent, 95 v.i....26-27
- Neutral solvent, 200-210 vis....23-24

Gulf Coast Lubes
- Bright stock, solvent, 95 v.i....26-27
- Neutral, solvent, 200 vis....23-24

Eastern Hemisphere

Singapore (Pulau Bukom) cargoes
- Avgas, grade 100/130....15.5
- Gasoline, 79 oct research....9
- **Kerosine....9.75†**
- Gas oil, 48 d.i. minimum....9

KEY PRICES—CRUDE OIL

(2¢ differential per deg. of grav. applies except as noted)

Western Hemisphere

United States (at the well)
- Mid-Continent, (Okla.-Kan.), 36.0-36.9....$2.69-2.97
- North Dakota, 36.0-36.9....2.47-2.87
- Texas:
  - Gulf Coast, low cold test, 26.0-26.9....3.50
  - Gulf Coast, Upper & Lower, 26.0-26.9....2.92-3.22
  - West Texas, sweet, 36.0-36.9....3.00
  - West Texas, N.M., inter., 36.0-36.9....2.93
  - West Texas, N.M., sour, 32.0-32.9....2.71
  - East Texas, flat....3.05-3.25
  - Mirando, 28.0-28.9....2.96-3.31
- Illinois Basin, flat....3.00
- Pennsylvania Grade, Bradford dist., flat....4.80
- California, Signal Hill, 21.0-21.9....2.33†
- North Louisiana-Arkansas, 36.0-36.9....2.72-3.02
- Wyoming, sweet, 36.0-36.9....2.85-2.90
- Wyoming, sour, 32.0-32.9....2.63-2.71

Canada (flat prices, at the well)
- Pembina (Alta.)....$2.38
- Leduc-Woodbend (Alta.)....2.53
- Redwater (Alta.)....2.42
- Steelman A (Sask.)....2.425
- Virden (Man.)....2.285

Venezuela (Cargoes, FOB lifting port designated)
- San Joaquin, 41.0-41.9, Puerto la Cruz....$3.10
- Oficina, 35.0-35.9, Puerto la Cruz....2.80
- Tia Juana, Medium, 26.0-26.9, Amuay....2.30
- Bachaquero, flat, La Salina....1.85
- Lagomar, 31-31.9, Cardon....2.55
- Lagunillas Heavy, flat, La Salina....2.07

†Differential per deg. of grav. varies

Eastern Hemisphere

Middle East, Persian Gulf (Cargoes, FOB lifting port)
- Arabia, 34.0-34.9, Ras Tanura....$1.80
- Safaniya, 27.0-27.9, Ras Tanura....1.47
- Iran, 34.0-34.9, Bandar Mashur....1.78
- Iran, 34.0-34.9, Abadan....1.73
- Iraq, 35.0-35.9, Fao....1.72
- Kuwait, 31.0-31.9, Mina-al-Ahmadi....1.59
- Qatar, 41.0-41.9, Umm Said....1.95
- N. Zone, Burghan, 23.5-24.4, Mina Saud....1.48
- N. Zone, Ratawi, 23.5-24.4, Mina Saud....1.41
- N. Zone, Eocene, 16.5-17.4, Mina Saud....1.28

Middle East, Eastern Mediterranean
- Arabia, 34.0-34.9, Sidon....$2.17
- Iraq, 36.0-36.9, Tripoli, Banias....2.21

North Africa, Phillipeville, Algeria
- Hassi Messaoud, 48 and above....Withdrawn

KEY TANKER RATES

(Last paid, per long ton, single voyage)

- **U.S. Gulf-New York, clean (USMC+52½%) $4.35†**
- **U.S. Gulf-New York, dirty (USMC+42½%) $4.06†**
- **NWI-USNH, dirty....(USMC—55%) $1.24↓**
- **NWI-UK/Cont., dirty....(Scale—52½%) 15/7*↓**
- Persian Gulf-UK/Cont., dirty....(Scale—52½%) 29/6*
- Persian Gulf-USNH, dirty....(USMC—65%) $4.45

**Sterling*

F. H. Moore

H. L. Waszkowski, Jr.

R. R. Jackson

E. V. Watts

FRED H. MOORE has been elected executive vice-president of Mobil Oil Co., New York, and **H. L. WASZKOWSKI, JR.**, succeeds him as vice-president of Mobil's exploration and producing department, in New York. In his new position, Moore will coordinate the activities of the marketing, manufacturing, supply and distribution, pipeline, and traffic departments. Waszkowski, who will move to New York, has been division vice-president in charge of the South Texas-Gulf Coast area, with offices in Houston. **R. R. JACKSON**, formerly vice-president of manufacturing and supply, has been named to the newly created position of vice-president of programs and supply-distribution. He will coordinate the programming of profit opportunities for Mobil as they affect availability and distribution of products. At the same time, **E. V. WATTS** was named to succeed Waszkowski as division vice-president in Houston. Watts has been division vice-president in Denver. **A. O. Detmar** will move to Denver as division vice-president, and **O. H. Blexrud** succeeds him as president of Mobil Oil of Canada, Ltd., in Calgary.

MASON L. HILL, manager of exploration for Richfield Oil Corp., Los Angeles, will become president of the American Assn. of Petroleum Geologists in April, at the association's annual meeting in Denver. Members of the 1961-62 executive committee, who will serve with Hill, include **J. Bob Carsey**, exploration advisor, Humble Oil & Refining Co., Houston, new vice-president, and **Ben H. Parker**, Frontier Refining Co., Denver, past president. **George V. Cohee**, U.S. Geological Survey, Washington, D. C., who was re-elected secretary-treasurer of the association, and **Grover E. Murray**, Boyd professor of geology, Louisiana State University, Baton Rouge, who was reelected editor, will also be members of the executive committee.

LOUIS F. DAVIS, assistant general manager for Atlantic Refining Co. at Dallas, is the new northern Texas regional vice-chairman for the Texas Oil Information Committee, and **John C. Johnston**, vice-president of Pan American Petroleum Corp., Houston, is southern Texas regional vice-chairman. Davis, who succeeds **Hamilton Rogers**, executive vice-president of TP Coal & Oil Co., Ft. Worth, will guide oil industry public relations in 78 counties in North and East Texas. Johnston will be in charge of 90 counties in South Texas. He succeeds **L. Chase Ritts**, vice-president of Pan American. Davis and Johnston will serve two-year terms in the OIC program sponsored by the Texas Mid-Continent Oil & Gas Assn.

JOHN A. McCONE has been elected a director of Standard Oil Co. of California, San Francisco. McCone was chairman of the Atomic Energy Commission in the Eisenhower Administration. In his new position, he succeeds **Robert Watt Miller**, who has resigned.

W. A. MALEY has joined the headquarters staff of Humble Oil & Refining Co., in Houston, as assistant to the vice-president for exploration. Maley, who has been associated with Humble since 1925, was most recently manager of the Humble Division's exploration department, with offices in Houston. He joined the company in the San Antonio district as production and field geologist. In 1929 he was named Corpus Christi district geologist, and in 1937 he became division geologist for Southwest Texas, with offices at Corpus Christi. He was appointed manager of Humble's exploration department in 1948, a position he has held up to the present time.

W. A. Maley

L. M. Gelvin

L. **MILLARD GELVIN** has been named assistant to the president of Sunray Mid-Continent Oil Co., Tulsa. Gelvin, who joined Sunray Mid-Continent in 1959, was most recently assistant treasurer for the company, and for DX Sunray Oil Co., its refining and marketing subsidiary. He has also been manager of operations and production for another oil company in Tulsa, where he was in charge of leasing, drilling, and other field operations.

H. W. Haight

F. M. Darrough

N. Jones

H. W. HAIGHT has been named executive vice-president of Humble Oil & Refining Co., in its headquarters organization at Houston, and **FORREST M. DARROUGH**, Humble's associate general counsel, moves up to general counsel, succeeding **NELSON JONES**, who has been elected a director of the company. Humble now has three executive vice-presidents: **C. E. Reistle, Jr.**, **William Naden**, and Haight. Haight is also a director of the company and a member of its executive committee. He has been serving as vice-president with broad responsibilities for exploration and production. Haight, who joined the Standard Oil Co. (N. J.) organization in 1927, became president of its Venezuelan affiliate, Creole Petroleum Corp., in 1954. He was named chairman of Carter Oil Co., early in 1959, and held that position until later that year when he was invited to join the new Humble Oil & Refining Co. as vice-president and director. Darrough, Humble's new general counsel, joined its headquarters staff in Houston in 1959. Before that he had been vice-president and a director of Carter Oil. Jones was general counsel and a director of the former Humble Oil & Refining Co. before 1959, when he was named general counsel for the new company. Jones has also served as vice-president and a director of Humble Pipe Line Co., another company in the groups.

RICHARD M. MORROW has been appointed division engineer for Pan American Petroleum Corp.'s central division, with headquarters in Oklahoma City. He will move from New Orleans, where he has been district superintendent for the production department since 1959. Morrow joined Pan Am in 1948 as a junior petroleum engineer at Hastings, Tex., and later became a field engineer and district engineer for Pan Am's Gulf Coast division. In 1958 he transferred to the company's general office in Tulsa as reservoir engineering supervisor, and later that year was named assistant division engineer for the Gulf Coast division.

R. M. Morrow

W. W. Shaw

WILLIAM W. SHAW is the new manager of Sinclair Pipe Line Co.'s right-of-way department, in Independence, Kan., succeeding **Fred A. Crane,** who is retiring. Shaw, who was formerly assistant manager of the right-of-way department, began his Sinclair service with a predecessor company in 1927. **Hamilton A. Cade,** right-of-way supervisor at Independence, succeeds Shaw.

JOHN CARPENTER has joined Coral Drilling Co., New Orleans, as assistant manager and special representative. Carpenter, who has been with Offshore Co., Baton Rouge, La., for the past ten years, was most recently its industrial and public relations director.

DANIEL L. HUSSEY, who has been on a loan assignment with Standard Oil Co. (N. J.), at its refinery in Cologne, Germany, returns to the Esso Standard division of Humble Oil & Refining Co., as government representative for New Jersey. He will be located at Esso's Bayway refinery, in Linden, N. J., where he has spent most of his 35 years with Esso. In his new position, Hussey will work with Esso marketing and manufacturing management throughout the state. Hussey went to the new Cologne refinery in 1958 to assist with the organization and training of the work force, and stayed for a year of full-scale plant operations. On another loan assignment from Esso in 1954 and 1955, Hussey was involved in returning the Abadan refinery in Iran to production. It had been shut down for three years, following Iran's nationalization of its oil industry. Hussey later became general manager at Abadan and a director of Iranian Oil Refining Co. He returned to Bayway in 1955 as assistant general manager of East Coast manufacturing operations.

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PRODUCING LEASE
IVANHOE DOME FIELD
CENTRAL MONTANA TYLER PRODUCTION

SEALED BIDS will be received by the undersigned until 2:00 o'clock P.M., Friday, March 31, 1961, for purchase by cash of 100% of the working interest of five (5) Tyler sands wells (presently producing approximately 220 BOPD) and miscellaneous personal property constituting and located upon the following:

All of Sec. 16, T-11N, R-31E, Musselshell and Rosebud Counties, Montana, containing 640 acres, more or less.

Additional information may be requested from or inspected at 803 Midland Bank Building, Billings, Montana.

The right to reject any or all bids is reserved.

Final decision with reference to the disposition of the bids will be made within fifteen (15) days of the opening.

Upon acceptance of any bid the applicant must tender a certified check in the amount of $10,000.00 within five (5) days of notification of acceptance. Balance upon title clearance.

J. V. Montalban,
Receiver for R. P. Oliver Ltd.
803 Midland Bank Building
Billings, Montana

MANAGER— NATURAL GAS SALES

Medium-size fully integrated oil company needs an experienced professional engineer with ten or more years in the natural gas industry. This man must have the ability to initiate gas purchase contracts and negotiate for the sale of natural gas after determining the feasibility of such sales through economic studies. Familiarity with the southwestern and Rocky Mountain areas of the United States is a necessity.

All replies are strictly confidential and our employees know of this advertisement. Submit a complete résumé, including recent photograph, salary requirements, and references to P-6128, Petroleum Week, 520 N. Michigan Ave., Chicago 11, Ill.

"SEARCHLIGHT" Can Help You!

When you want to buy or sell used or surplus new equipment and/or accessories, or have other business wants—advertise them in the SEARCHLIGHT SECTION for quick, profitable results!

U.S. GOVERNMENT

SEALED BIDS will be received until 10:00 A.M. Mountain Standard Time, February 23, 1961, and opened at that time in the office of the Navajo Indian Agency, Window Rock, Arizona, for oil and gas leases, on 56 tracts of tribal lands, totaling approximately 93,066.58 acres, located in San Juan County, New Mexico. Details of the lease offering and filing of bids may be obtained by addressing an inquiry to the General Superintendent, Navajo Indian Agency, Attention: Branch of Realty, Window Rock, Arizona.

BUSINESS OPPORTUNITIES

Use this Classified Advertising Section for bringing business needs or opportunities to the attention of men associated in administrative, executive, management, sales and responsible technical engineering and operating capacities within the oil industry.

PETROLEUM WEEK

Now Is the Time for Preparedness

TWO RECENT STUDIES by committees of the National Petroleum Council offer some sobering reflections on the vulnerability of the industry in the event of an emergency curtailment, or complete shut-off, of essential materials or supplies.

In effect, the two studies show rather clearly that "for want of a nail . . . the kingdom [could be] lost."

It was not the purpose of the two study groups to recommend solutions to the predicament that could befall this essential industry. Their assignments, which came from the government, were to delineate the impact of such curtailments as a preparedness measure for future guidance.

It now appears mandatory, however, that the industry, perhaps working with appropriate governmental agencies, should start with the problems defined by the two study committees, and search for solutions.

IN ONE AREA it would appear that substitute materials could be developed to bridge the gap that might be created. A study on the maintenance and chemical requirements of refineries and natural gasoline plants found that a shut-off of process chemicals would limit much of the industry's capacity to less than 13 weeks of operation. Specifically, a cut-off of process chemicals would, within three months, affect more than 90% of the capacity involved in making motor gasoline. In many instances, shut-downs would occur after two weeks.

The key processing chemicals include, among others, sulfuric acid, tetraethyl lead, catalysts, and sodium hydroxide. Substitutes for such materials, obviously, will be difficult to find and, even if developed, may not be satisfactory replacements. But they may be necessary for a short duration.

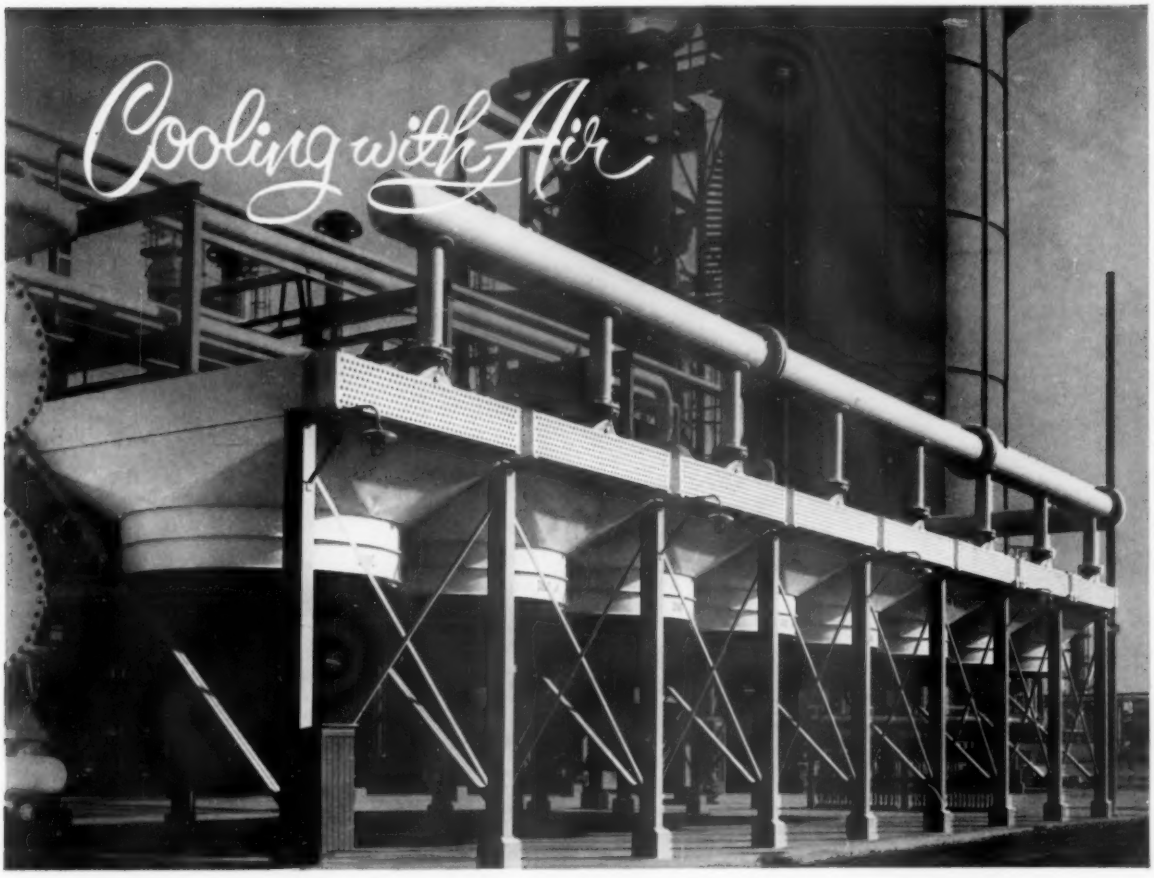
A curtailment of maintenance supplies would not have an immediately serious impact on most processors. But new operating methods may have to be devised to get around the effects of a prolonged shortage of key maintenance supplies.

The other NPC report, on proved hydrocarbon reserves and availability (page 14), contains two important warnings. One is that regardless of the nation's now ample reserve producing capacity, it could not be made available to markets on short notice should an emergency arise, due to the limitations of transportation facilities.

Also, the reserves study committee reported that should an emergency require maintenance of production at capacity level, many measures would have to be taken, all of which would require considerable steel and other essential materials.

NEITHER OF THOSE TWO FINDINGS is surprising. The industry had such experiences in World War II, as well as during the early '50s.

The industry has had ample warnings—and experiences. But it still lacks suitable methods to cope with shortages.



IN THE BAYWAY REFINERY . . .

of the Esso Standard Division of Humble Oil and Refining Company.

The above pictured installation of HUDSON Solo-aire units obviated costly addition to the existent and comparatively high-maintenance-cost water system.

Over-all economic comparisons of HUDSON Solo-aire cooling versus water cooling almost invariably result in selection of Solo-aire units for much or all process cooling.

In two complete 40,000 barrel seaside refineries constructed abroad, Solo-aire units are used for ALL process cooling services. NO WATER IS USED FOR PROCESS COOLING.

In the United States in a 40,000 barrel refinery built adjacent to an unlimited water supply, 50% of the total dissipated heat is transferred directly to air through Solo-aire units.

Operating results of thousands of HUDSON Solo-aire units installed in oil, gas and chemical plants throughout the free world have established HUDSON leadership in the field of direct cooling with air.

ONLY HUDSON designs and manufactures ALL THREE categories of cooling equipment . . . for cooling solely with air (Solo-aire); for cooling primarily with air but with minimum water to obtain low effluent process stream temperatures (Combin-aire); and water cooling towers. Take advantage of HUDSON'S objective assistance in selecting the integrated cooling system which best balances capital investment and operating cost for the specific process, climatic, and water conditions.

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Check the areas where hard, high-strength and hard abrasive formations predominate . . . there you'll find operators relying on Hughes bits to keep costs down.

Why? Because Hughes bits through the years have reflected the experience and knowledge gained by Hughes engineers in designing bits to drill the world's *hardest-to-drill* formations.

Your local Hughes representative can help you select the types of bits that will deliver your *most economical footage*. In some cases, it may be one of Hughes' milled-cutter bits. In others, the "Hugheset" bits—RG-7J, RG-1J, or RG-2BJ. The performance of these bits is spectacular where air or airmist is used as the circulating medium.

Or, it may be one of the new "Hugheset" *sealed bearing bits*, now making footage previously undreamed of in formations where bits are exposed to abrasive-ladened fluids.

Wherever you drill, an experienced Hughes representative can help you set up a cost saving bit program.

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AND WORLD'S LEADING DEVELOPER OF CONE-TYPE ROCK BITS